
ILLINOIS STATE
DAIRYMANS ASS'N

PROCEEDINGS OF THE

Thirty-Fourth Annual Meeting

OF THE

Illinois State Dairymen's Association

Held at Marengo, Illinois
January 14, 15, 16
1908

NEWS-ADVOCATE PRINT
ELGIN, ILLINOIS

Letter of Transmittal

Office of Secretary,
Illinois State Dairymen's Association,
Chicago, Ill., 1908.

To His Excellency, Charles S. Deneen, Governor of the State of Illinois:

I have the honor to submit the official report of the Illinois State Dairymen's Association, containing the addresses, papers, and discussions at its thirty-fourth annual meeting, held at Marengo, Illinois, January 14th, 15th and 16th, 1908.

Respectfully,
GEO. CAVEN, Secretary.

List of Officers.

President—

L. N. WIGGINS, Springfield.

Vice President—

J. P. MASON, Elgin.

Directors—

J. P. MASON, Elgin.
M. S. CAMPBELL, Genoa.
A. F. JANSEN, Effingham.
W. E. JANES, Hinsdale.
CARL E. LEE, Urbana.
L. N. WIGGINS, Springfield.
J. F. SANMANN, Havana.

Secretary—

GEO. CAVEN, Chicago.

Treasurer—

ADOLPH MEYER, Greenville.

By-Laws of the Illinois State Dairymen's Association.

Officers.

Section 1.—The officers of the Association shall consist of a President, Vice President, Secretary, Treasurer and Board of Directors, composed of seven members, of whom the President and Vice President of the Association shall be members and the President ex-officio Chairman.

Duties of the President.

Sec. 2.—The President shall preside at the meetings of the Association and of the Board of Directors. It shall be his duty, together with the Secretary of the Board of Directors to arrange a program and order of business for each regular annual meeting of the Association and of the Board of Directors, and upon the written request of five members of the Association it shall be his duty to call special meetings. It shall be his further duty to call on the State Auditor of Public Accounts for his warrant on the State Treasurer, for the annual sum appropriated by the Legislature for the use of this Association, present the warrant to the Treasurer for payment, and on receiving the money receipt for the same, which he shall pay over to the Treasurer of the Association, taking his receipt therefor.

Duties of the Vice President.

Sec. 3.—In the absence of the President his duties shall devolve upon the Vice President.

Duties of the Secretary.

Sec. 4.—The Secretary shall record the proceedings of the Association and of the Board of Directors. He shall keep a list of the members, collect all the moneys due the Association (other than the legislative appropriations), and shall record the amount

with the name and postoffice address of the person so paying, in a book to be kept for that purpose. He shall pay over all such moneys to the Treasurer, taking his receipt therefor. It shall also be his duty to assist in making the program for the annual meeting and at the close of the said meeting compile and prepare for publication all papers, essays, discussions and other matter worthy of publication, at the earliest day possible, and shall perform such other duties pertaining to his office as shall be necessary.

Duties of the Treasurer.

Sec. 5.—The Treasurer shall, before entering on the duties of his office, give a good and sufficient bond to the Directors of the Association, with one or more sureties, to be approved by the Board of Directors, which bond shall be conditioned for a faithful performance of the duties of his office. He shall account to the Association for all moneys received by him by virtue of said office and pay over the same as he shall be directed by the Board of Directors. No moneys shall be paid out by the Treasurer except upon an order from the Board, signed by the President and countersigned by the Secretary. The books or accounts of the Treasurer shall at all times be open to the inspection of the members of the Board of Directors, and he shall, at the expiration of his term of office make a report to the Association of the conditions of its finances, and deliver to his successor the books of account together with all moneys and other property of the Association in his possession or custody.

Duties of the Board of Directors.

Sec. 6.—The Board of Directors shall have the general management and control of the property and affairs of the Association, subject to the By-Laws.

Four members of the Board shall constitute a quorum to do business.

The Board of Directors may adopt such rules and regulations as they shall deem advisable for their government, and may appoint such committees as they shall consider desirable.

They shall also make a biennial report to the Governor of the State of the expenditures of the money appropriated to the Association, and arrange the program and order of business for the same.

Election of Officers.

Sec. 7.—The President, Vice President and Board of Directors shall be elected annually by ballot at the first annual meeting of the Association.

The Treasurer and Secretary shall be elected by the Board of Directors.

The officers of the Association shall retain their offices until their successors are chosen and qualify.

A plurality vote shall elect.

Vacancies occurring shall be filled by the Board of Directors until the following annual election.

Membership.

Sec. 8.—Any person may become a member of this Association by paying the Treasurer such membership fee as shall from time to time be prescribed by the Board of Directors.

Quorum.

Sec. 9.—Seven members of the Association shall constitute a quorum for the transaction of business but a less number may adjourn.

Annual Assessment.

Sec. 10.—One month prior to the annual meeting in each year the Board of Directors shall fix the amount, if any, which may be necessary to be paid by each member of the Association as an annual due.

Notice of such action must be sent to each member within ten days thereafter, and no member in default in payment thereof shall be entitled to the privileges of the Association.

Amendment of By-Laws.

Sec. 11.—These By-Laws may be amended at any annual meeting by a vote of not less than two-thirds of the members present. Notice of the proposed amendment must be given in writing, and at a public meeting of the Association, at least one day before any action can be taken thereon.

Proceedings of the Thirty-fourth Annual Meeting of the Illinois State Dairymen's Association.

Held at Marengo, Illinois
January, 14, 15, 16, 1908

The Illinois State Dairymen's Association met in annual convention at the opera house, Marengo, Illinois, January 14, 1908, at 1:30 P. M. Vice President J. P. Mason in the Chair.

The Chairman.—Our President has been delayed and consequently cannot be here to open this meeting, so we will go on with the program. We will open our meeting this morning with prayer by the Reverend Mr. Schultz.

INVOCATION.

Rev. Mr. Schultz, Marengo, Ill.

Let us pray. We thank Thee, oh Lord of the harvests, for life and its inspirations and its aspirations. We thank Thee for changing seasons and harvests. We thank Thee, oh God, for the many blessings Thou hast given us.

We thank Thee for disinterested, pure science and for the work it is doing. We thank Thee for the co-operation between scientific men and our fellow dairymen and for the increase of co-operation which make for health, both of our childhood and adulthood.

We thank Thee for all the blessings Thou hast given to us in such rich measure and which we are utterly unworthy. We pray Thee, our God, that Thou would bless the scientific men and practical dairymen, bless their occupation and the work which they are doing.

We pray that Thou wilt help all of us in selecting the best things of life, not forgetting the things which pertain to the spirit. Wil't Thou help the tillers of the farms and workers of the dairies to select the best stock and produce the best product of the farm and dairy. We pray Thou wilt help them also in selecting the very best breed of cattle, that they may not forget to give to their children all the best advantages in education, founded on principles of the largest usefulness and for the highest Christian culture. We pray that the things of the spirit, of the moral life, of the Kingdom of God may be supreme among men of all vocations and of all lines of work. We ask that Thou wouldst help us to realize that the work which we do, of whatever kind it is, directly influences the moral life, and if the men on the farm and in the dairy are putting into the work honesty, integrity of purpose, and patience of spirit, they are working these very elements into their own lives. Help us thus to see how the moral life is related to all life and how God is related to us in everything that we do and that whatever we do, do it better to do it honestly and faithfully and carefully and with feeling of Divine love.

And so we ask Thy forgiveness if we slight our work in any part and wilt Thou forgive us if we are content with results of anything less perfect than the ideal, whether it is in the dairy or in the home or in our individual lives and in the lives of those whom we love? Forgive us if we fail to measure up to our best responsibilities and duties. We pray that Thou forgive all our sins of omission and commission and lead us into the larger life, the life which is held with Christ. These things we ask in the name of the great Shepherd and Bishop of our souls, Amen.

The Chairman:—The next is an address of welcome by Hon. J. H. Patterson, Mayor of Marengo.

ADDRESS OF WELCOME.

Hon. J. H. Patterson, Mayor of Marengo, Ill.

Mr. Chairman, Ladies and Gentlemen:—

I scarcely know what there is for me to say: I hope the treatment you dairymen receive from the people of Marengo will be such as will tell the story better than anything I have to offer.

Strictly speaking, we are not all dairymen in the city and yet a great many are depending on the dairy interests for a livelihood. The first twenty-five years of my life was spent on a dairy farm and the remainder of it selling feed and furnishing it to the dairymen. Whatever I have achieved during my life I am indebted to the dairy interests for.

We have no large factories in our place to show you and this it not the season when Nature combined with art makes ours one of the most beautiful cities in the state.

Most of our farmers have dairies and the majority of them produce milk for the Chicago market. We have an industry in our city which we want you all to see while here, that is the Borden Condensed Milk plant, and you will find it is a model of cleanliness. If you have any doubts about the healthfulness of their product, visit the dairy farms around here and follow the milk through the bottling works and you will see perfection has been attained. The management of the Borden Company invite you to visit their place while here.

Our people all want to see this meeting made a success, and I cordially welcome you in behalf of every citizen in this community. I thank you.

The Chairman:—The response to this cordial welcome will be made by Mr. Joseph Newman, of Elgin.

RESPONSE TO ADDRESS OF WELCOME.

Mr. Joseph Newman, Elgin, Ill.

Mr. Chairman, Mr. Mayor, Ladies and Gentlemen of the Illinois State Dairy Association:—

It is a pleasure to respond to the cordial welcome that the mayor of Marengo has given us. I was satisfied, when I heard that they had selected Marengo as a meeting place for us this year, that they had made no mistake. Marengo, situated, as she is, in the center of the fifty miles that furnish a large portion of the milk for the city of Chicago, viz: the sanitary milk that is being fed to the little ones in the large city, is geographically situated right. I knew some of the people here were right also, and I have had further proof of that within the last hour, having just come from friend Gilkerson's well spread table.

Perhaps you might wish to know the aims of the association and who compose it. The association is open for membership to all dairymen and all those who are interested in dairying in any way, shape or manner, either in the owning of cows, the owning of farms, the manufacture of dairy utensils or the transportation of the products, and we hope that all who visit us at this institution during this meeting will become members of this association.

We are working with the agricultural department at Champaign our state university, which as you well know has become one of the first universities in the United States this year, having over four thousand students, and the agricultural part has more than kept pace with the balance of the university. We shall hear from Professor Lee who has worked among you for the past five years, we also hope to have Mr. Glover with us during the session. The Association works also with the U. S. Department of Agriculture. They have been very kind in helping Illinois and have sent Mr. Credicott here to score the butter. You see these are all your own departments; you all help to build up these associations and they are kept alive through taxation, and of course the United States department is kept by the internal revenue department.

In a section located as this is, the subject that will probably receive a good deal of attention will be the cost of the raw material. Chicago, of course, is paying a good deal attention these days to this question of cost of the raw material, and while the citizens of that great city are being called upon to pay an advanced price for milk, we who have something to do with the making of milk know what it costs. We know that five years ago the price of all kinds of feed was, on the average, about 50 per cent less than today; we know that bran was sold at $10 or $12 a ton and now it is being sold for $20; we know corn was 25c. and is now 50c., and these are the two staples for making a first-class article of milk. It is the foundation of feed for producing that article. We know that ten years ago a very fair cow could be bought for $40; what can you get today for $60? We know that the work the University has done is weeding out the poorer cows and helps us to see the folly of keeping poor cows at any price. For that reason the good cows are sold for more money, and they are worth it. Taking all these things and the value of land into consideration, why should not milk be worth to a producer today twice what it was five years ago? It was because Marengo was in the heart of this territory that furnishes Chicago milk that she was selected for a meeting place this year. A great deal of complaint has come from Chicago because milk has been advancing in price until today it is selling for eight cents a quart. They say the farmers receive less than four cents for it, so why should they as consumers give twice that much for it? I would call attention to my farmer friends who have ever tried to do business in a large city. If you believe the criticism made by the consumers, follow the matter out and I believe you will be better satisfied that it costs more to market this milk than it does to produce it. That may be a very strong statement but I went into the subject very carefully and I think you will find I am right.

I believe that in the city of Chicago the matter of keeping teams of a large milk company is a very large item. If you could see the figures for that one branch of the work alone it would be very surprising. I have one firm in mind, the Ira J. Mix Co., on the South side of Chicago, one of the companies complained of by citizens there and through the grand jury indicted, whose expense of maintaining their wagons and run-

ning their milk delivery business there for thirty days is over $10,000.

So it was to bring out some of these thoughts, to discuss these matters in some papers and if not in the papers formally to try to bring the truth of this matter before the people through the newspapers, to show them that it does cost money to make a first-class article of sanitary milk fit for anybody to consume, and that must be clean milk, that we meet here in Marengo today. Cleanliness and cold are the two simple things that go to work to make a first-class article of milk. Cleanliness is next to Godliness, in fact in my judgment it is Godliness and cold in the handling of your product, will help those companies that come into your communities and place their products more than anything else, simply cleanliness from the grain that is put into the feed to the milker that is milking the cows.

We shall have papers in regard to crop rotation and the keeping up of the soil, development in breeding and selecting of the best cows, all of these things, but I think after all the question of the cost of milk and the economical milk production are two things that should receive the most attention at this meeting. This association, of course, is for the fair discussion of all such questions, which are open to all, and they will show the city consumers that a clean, wholesome milk cannot be sold for less money than the present price. Of course the price of butter this winter received its blow, with all the other things, in the financial flurry we had in October and November, but it is recovering. The market has held conservatively and is being so held. Thirty cents yesterday was the wholesale price of fine creamery butter. This means butter that would score about 93 points out of a possible 100.

In the butter question we come across oleomargarine and butterine propositions. There has been more oleomargarine and butterine made this year, I am sorry to say, than have been made in the past two or three years, owing of course to the high prices of butter during the summer. Certain classes of people thought they must have something which was cheaper, which we are pleased to say they can have in oleomargarine for everyone should have what he wants, but the trouble is they go to the store and ask for butter, pay for butter, and get oleomargarine, which is dishonest. The Pure Food Department of Chicago is looking

into this matter and restaurants, hotels and the different places that are selling this stuff, butterine, and palming it off on us for butter, will sooner or later come to grief and it will cost them a great deal of money. I presume in a city the size of Marengo you are not troubled much in this way, but in the larger cities there are millions of pounds of oleomargarine being consumed as and for butter, which is wrong and I believe sooner or later it will be eradicated.

As I said before, we made no mistake in coming to Marengo, Mr. Mayor and I can say for the people that will compose this meeting, you need have no fear but what the city rules and laws will be lived up to. We are a clean lot of people and ready to be scrutinized by anyone and we hope we shall do this community a lot of good, know we will if you all take an interest in the subjects and discuss the papers as they come up. Do not sit still after the paper has been read to you and let it fall flat. Some one ask a question about something you do not understand. The interest of a meeting depends to a large extent on the questions and discussion of a subject, and I am satisfied if you take the interest in the meeting that you should, Marengo will not be sorry she has asked the Illinois Dairy convention to meet here. I thank you.

The Chairman:—Mr. Newman, in mentioning the work the association and the department of Agriculture are doing together, forgot to say that Mr. Lane, of the Department of Agriculture, as well as Mr. Credicott, is here. Mr. Lane is Assistant Chief of the Dairy Division, has conducted the milk test this morning and will speak this afternoon. We consider it quite an honor to have both Mr. Lane and Mr. Credicott with us, and Mr. Newman's not mentioning Mr. Lane was merely an oversight.

Mr. Newman:—I should not have mentioned any names because I am satisfied that everyone of the Department is with us in spirit and heart.

The Chairman:—Ts the president is not here, we cannot have his annual adress and will take up the next number on the program, "Lessons from the Milk Test," by Mr. C. B. Lane, Asst. Chief of the U. S. Department of Agriculture, Washington, D. C.

LESSONS FROM THE MILK TEST.

Mr. C. B. Lane, Assistant Chief Dairy Division, Department of Agriculture, Washington, D. C.

Mr. Chairman, Ladies and Gentlemen:—

It is a great pleasure to talk to you a little while about this subject of milk contest and Illinois dairymen are to be congratulated on the test they had this year. It is not a large one but it is a very creditable one and the quality of the milk and cream is good. Illinois is to be particularly congratulated because this is her first contest. In a number of states, where contests have been held from time to time, they only had three or four samples the first time, while you have eight, which is very good for a start.

I have followed these contests with a good deal of interest since they were first organized and I believe they are going to have a great influence in the improvement of the quality of the milk and cream in the future. Friendly contests of any kind are a great incentive, whether it is in athletics or in milk and butter, such contests as you have here, or whatever they are; when you put your product against the other fellow's you are bound to learn a number of things which you never knew before, whether your product is better than the other fellow's or not as good you will learn a lesson in either case, for if your product is as good as the other man's you know that you are practicing right methods and working along right lines; if it is not as good you know where you need to improve as those defects are pointed out to you. As I say, I have watched these contests with a good deal of interest since, the first, which was held in Chicago in February 1906. This, as perhaps you know, was a national contest and all the states in the Union were allowed to come into it, so milk was shipped from some thirteen different states. Came from the West as far as Kansas, East as far as Boston, and South as far as Maryland, a good deal of it shipped a thousand miles, and yet that milk kept sweet and good for several weeks, and some of the cream for five weeks, which


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shows, as has been stated here, that all that is necessary to improve the quality of our milk and cream and butter are cleanliness and cold.

I was interested, in coming into Chicago on a train the other day in a dining car, to find milk on the menu, so I ordered milk to see what I would get and they brought me a nice little bottle, very attractve, about as wide as it was high, and contained one-third of a quart, the price was 15c. That would be 45c. a quart or $1.80 a gallon. The point that impressed me was the possibility of getting such a price for the product of market milk. To me it meant a great deal. If the public will accept sweet market milk of good quality at a price of 45c. a quart, does it not show a great possibility along that line? I believe market milk in the future is going to be put on a higher plane, and why not? A product that is a complete food in itself, a product that is almost entirely digestible and a product that is a food for everybody, why should it not bring the highest price of any food product in the market? And yet today, you know we are not paying anywhere near the price for nutrients in milk that we are in meat or foods of that character, and so, as I say, I believe we have great encouragement along that line; the consumer in the future is going to discriminate more than he has in the past, is going to call for a higher quality of milk and is going to be ready to pay for it, and there is another thing sure, that the producer is going to be willing to go to the trouble of making that milk clean and pure. In one of our certified milk plants today, the cows are receiving a daily bath, simply because the consumer is willing to pay the extra price for the milk which that extra labor and care involves. The certified milk and higher grades of milk are increasing right along, day after day, and we want to produce more milk of that character. Perhaps I am getting a little off my subject.

I want to take up some of the points in this milk contest by the scoring of milk, which I talked about a little this morning. I know we are beginning to judge milk from a little different standpoint than we did ten years ago. At that time the Boards of Health would simply examine milk for fats and solids and preservatives, and that was as far as they cared to go. Now we are going farther and making tests for bacteria, for dirt, for temperature and a lot of other things, and so it is in this

scoring contest. We are not only examining the milk chemically but bacterially and it must have thorough examination all along the line.

Flavor. The first, in scoring milk, to be considered is flavor and we give forty points on that out of 100, because we consider flavor the most important quality in milk. If milk is not good flavor it is of little value for anything, either as market milk or making butter or cheese and so in our score cards, like the score cards for butter and cheese, we give flavor a large proportion of the points. I think in your butter score card here you allow 25 points for flavor and in cheese 30 points for flavor, and it is right that flavor should be given that number of points. Of course all clean milk has little flavor; if it is fairly rich it may be described as rich and clean, sweet and pleasant but with no distinct flavor, and if you find any flavors in market milk you may be pretty sure they are foreign flavors, and of course we do find flavors of the cow stable, flavors of strong food, flavors of sap powders used in washing the bottles and smothered flavor, due to the milk being closed too tightly when it is warm, and a great many other flavors. If any of you have ever taken a dozen different samples of milk and examined them critically for flavor, you must have been surprised at the great variety of flavors and tastes that you got, but I am very glad to say that the milk and cream exhibited here on the whole was of very good flavor.

Following flavor, we determine the number of bacteria in the milk and the number of bacteria of course really serve as an indicator. If the number of bacteria run high we know it has been produced in an unsanitary condition, not properly cooled, or too old. We know there is something wrong somewhere along the line, and so we determine the number of bacteria and that gives us a pretty good idea of the way the milk has been handled. If the bacteria do not exceed ten thousand to the cubic centimeter or fifteen drops, we score the milk perfect; and if they run to one hundred thousand we consider the milk of fair quality; but at five hundred thousand we do not give anything for bacteria because milk that contains five hundred thousand bacteria is poison and is not fit for consumption, is strictly dangerous to feed children and infants, and so we make quite a point of this question of bacteria in milk.

The question was asked this morning as to how bacteria get into milk. There are a thousand ways in which they get into milk. We know they are small germs of plant life that require moisture, require warmth to grow, just the same as any other plant, and if we furnish these conditions we are bound to have large numbers in our milk. They get in through the air, through dirt from the cow, through dirty hands of the milker, dust of the stable, through milk utensils and various other ways, flies, particles of dry manure. All those things contribute thousands and thousands of bacteria to the milk and it is possible for a single fly to carry a half million bacteria into milk. If he is a fairly clean fly he might not put in more than seven or eight thousand, but a fly from the swill barrel is a pretty bad fellow. So the bacteria runs in some of those samples of milk, and if you stop to think over the care you have given the milk before you sent it here, you can determine how some of the bacteria got in.

Another point is the acidity of milk; by acidity we mean the real sourness. Of course milk naturally is slightly acid, contains about .07 per cent of 1 per cent of acidity but if it gets up to .2 per cent or higher it shows there is something wrong, it has either been kept too long or there are too many bacteria in it, and so we make a point of acidity. Milk is perfect if it does not go over .2 per cent and over that we make deductions; at .3 per cent the milk begins to taste sour but that is a pretty good indication of the way the milk has been handled, by determining whether acidity is high or low.

General appearance of package and contents. If I had time I would like to describe that matter fully. You know a good many of the bottles we found in our markets have tin parts, rubber parts and metal parts attached to them, which are difficult to clean so we make deductions where we find them. The packages sent to this contest were perfect in that respect.

Then we examine the milk for dirt and usually find that in the bottom of the bottle. I regret to say half of the samples here had more or less dirt, but from what some of the dairymen told me I do not think that will ever happen again. That dirt probably got in through the dirt on the cow or from dust in the stable, or in a similar manner. In the contest we had in New Hampshire one man in particular had a good deal of dirt in his

milk and he said it would never again happen, and this year he won a prize. This is one of the advantages of the milk contest, it points out to the dairymen the defects in their milk and shows them where they can improve, and they do improve to a point where they get a better price for their milk in a great many cases.

I want just to relate the effects one of these contests had in the city of Cleveland, Ohio. Cleveland was the first city that ever held a milk contest and they had some sixty-five samples this year; we had an all day dairy meeting and the dairymen were very enthusiastic about the contest. Before that they had been fighting the Board of Health because they were trying to improve the dairy conditions, but after the milk contest was held and the matter was explained, the dairymen began to look at it from the right standpoint and decided the Board of Health was all right and that it would be to their advantage to improve the quality of the milk and cream and improve conditions in their dairies, so thirteen of the better dairymen in that city got together and sent this letter to the Board of Health. I simply read it to show the position which the dairymen are taking these days on the question of market milk. They want to be on the right side, realizing that it is getting to be very important not only from a health standpoint but from the standpoint of their pocketbooks, and they are beginning to get more money for the better product. The letter is as follows.

We Milk Producers:—

Who ship milk to the city of Cleveland, desiring to make and ship milk of good quality and to observe the sanitary regulations as prescribed by your honorable body, respectfully ask that each and every person shipping milk to the city of Cleveland be required to take out a permit, to be issued by your honorable body, revocable at your pleasure. That said permits shall be classified as 1 or 2. That dairies which score 50 points or above, be classified as No. 1, and all dairies which score below 50 points be classified as No. 2. That all milk dealers, shippers, and pedlers, who sell milk in the city of Cleveland be required to apprise their customers by placard, or otherwise, at all times, of the class of milk that they are offering for sale, and in case of failure so to do, or in case of said dealer, shipper or pedler offering

for sale milk shipped into the city of Cleveland without a permit, said milk dealer, shipper or pedler's license shall be forfeited.

Austin Herrick,	H. E. Post,
W. A. Mills,	G. W. Adams,
H. F. Bicker,	W. H. Chambers,
S. H. Mizer,	A. F. Dreaher,
C. H. Bennett,	C. E. Riley,
E. Bowen.	

When the dairymen themselves, on their own initiative, got together and informed the Board of Health that they wanted to do things right, that they wanted to have their dairies improved and the quality of the milk improved, it was a long step in the right direction. I know that many dairymen do not understand why it is that methods which have been pronounced O. K. for the last twenty-five years are suddenly turned down, and it is right that they should have an explanation but the more we learn about bacteria and causes of disease and the importance of pure milk, the more we study this question, the more we see the importance of it and the dairymen are beginning to see the importance of it too. I was particularly interested in one dairy in Cleveland, I think one of the poorest I ever saw, scored 24 points on a basis of a score card of 100; that same dairy today, I am told, will run up to 75 or 80 points. They have put in windows, a cement floor and a system of ventilation, have everything sweet and clean and in nice shape because they realize it is a matter of dollars and cents as well to give them more pride in their work and they are getting a higher price for their milk by improving their dairy in that way. I believe that the dairymen as a whole are working along the right line in this matter but up to the present time there has not been very much incentive for improvement. Dirty milk has sold for the same price as clean milk and is today in many cases selling for the same price and unless the dairyman gets more for his milk there is little incentive for improvement. The consumer will play an important part in this campaign for better milk. The consumer should demand that milk be clean and should be willing to pay the extra price which the production of clean milk involves. Of course a great many consumers look upon milk as an article of food to be purchased at the lowest price possible and do not

appreciate the fact that the price of feed has been increasing during the past ten years and is now nearly double what it was ten years ago; the price of labor has increased and the cost of producing milk has increased all along the line. The consumers will begin to appreciate that and the time will soon some when there will be a call for better milk and the producer should be ready to supply that demand.

I say the consumer does not appreciate good milk and I might give an instance to support that. A producer near Philadelphia, who was selling certified milk, called some of his best customers out to his dairy one day to look the place over and he thought he would give them a test to see if they knew what clean milk was, so he had three kinds of milk prepared for them to taste; No. 1 was his clean certified milk, No. 2 he had injected in a little cow flavor and No. 3 a little more of that flavor. He passed the milk along to those ten or twelve consumers, many of whom held high positions; they tasted sample No. 1 and said it was a little flat, there was something lacking, it did not seem to be quite right; they tasted sample No. 2 and said that was a little better than the other but it was not quite what they had been accustomed to; then they tasted No. 3 and pronounced that the best of the lot, so I say consumers today do not appreciate the value of clean milk and there is just as much need for education, and I believe more, of the consumer than there is of the producer and it is the consumer who is going to have great influence in this campaign for cleaner and better milk.

Now these contests are of value to the dealer because they are taking advantage of it in assisting them to determine where the good dairies are, hence making it easier for the dealers to find a supply of milk to meet the demands made upon them for a good product. With a supply of good milk to handle there is less trouble with sour milk and less complaint from consumers. These contests are of great value to them, not only milk contests but dairy farm contests, such as the one held in Cleveland. I know in my own case when we began to score dairies around Washington, our milk supply at home was very unsatisfactory. I looked at the score of the dairy we were taking milk from, and found it scored 37; then I looked down the line, found the dairy that scored 70 or 75 and changed to that dairy and bought milk at the same price.

What will become of the dairyman who is not up-to-date and is not producing clean milk? He has to sell his milk for a lower price. In the city of Mount Clair, N. J., for instance, the Board of Health makes a careful report; they report the number of bacteria in the milk, percentage of fat, of solids, the dirt, and publishes it so the people can see just what the condition of the milk is. What is the result? The better dairies, the high scoring dairies get a good price for the milk, and the low scoring dairies have to sell milk for two cents a quart less. Is that not right? Is that not as it should be, good milk for good prices and poor milk for poor prices? I think that is fair.

I believe the time is coming when the consumer, the producer and the dealer are going to get together in this matter. In fact they are doing it in some of our cities today. The producer will have to use more care in production, bring his dairies to a higher level, and the Board of Health must see that he is not unjustly prosecuted, as he is sometimes. The Board of Health must see to it that the inspectors who are sent out understand their business. Then what we need is not more dairy knowledge, perhaps, but a better application of that we already have.

Just one word about the milk contest another year. I certainly hope you will all come into this, it will surely be to your advantage. As I said before, if your product is all right, you are going to know it and if it is not right you will know where you need to improve it, so I hope you all will come into this contest next year and make it a success. I thank you.

DISCUSSION.

The Chairman:—Are there any questions regarding this subject? These papers are all open for discusion. Discussion is the life of these meetings and we want to learn all we can. We are particularly anxious to have you ask questions.

Member:—I would like to ask Mr. Lane if he will comment somewhat on the scores he made this morning?

Mr. Lane:—The scores have not been finished yet. The milk and cream has all been scored for flavor and, as I said before, it was generally very good, the higest score 37 out of a possible 40 and the lowest 33. As to bacteria, these will be counted by a professor who was here from Madison and has

taken them home and will wire results Thursday, so the results will be announced at that time. As to acidity of milk, practically all passed in that; as I said before, about half the samples had more or less dirt or sediment in the bottom of the package that I did not like to see, and of course it is not necessary. Some of you might have had as much dirt in you milk before you sent it here and had strained it out; of course that saves you on the score but it does not remedy the matter, for the dirt has been in the milk and the bacteria is left in it and never will be taken out, but of course we should not have any visible dirt in the milk. I am not able now to go much further into this matter of scores but the score cards will be filled out Thursday and placed with the exhibits in the exhibit room and everyone can find out how much he stands, and prizes will be awarded on quality.

Member:—Is milk sterile or free from bacteria when it is drawn from the cow?

Mr. Lane:—Not quite sterile but pretty nearly so.

Member:—Is not some bacteria always present?

Mr. Lane:—Yes, because the point of the teat always contains more or less bacteria and some get into the udder, so there are always a few bacteria in the milk.

Member:—The milk in the udder should be free from bacteria, should it not?

Mr. Lane:—The milk is manufactured largely during the process of milking. Some think there is a whole pailful of milk in the udder; there is only a small amount already deposited in the udder and as the milking progresses the milk is manufactured, you might say, and the small amount in the udder is more or less contaminated although there may be only a few hundred bacteria present. Of course if you cool the milk as soon as it is drawn, it is possible to secure milk with only a few hundred bacteria. Occasionally, in certified milk, samples have been tested with no bacteria found, but that was simply because the dilutions used were so great that they did not happen to be caught. But even in milk produced with the best of care, there are always a few bacteria.

The Chairman.—If the number is increased quite materially, does it not indicate that there is some disease of the udder?

Mr. Lane:—It is possible to increase the number of bacteria in the udder if the cow has any trouble with the udder, such as

inflammation, in which case the bacteria would be much increased. I remember some experiments were made at Little Falls. Everything was going along smoothly, when suddenly the bacteria in a certain amount of milk jumped up to several thousand without apparent cause and we found it was because of one cow that had a little inflammation of the udder, not from the use of the milking machine however, and she put all those bacteria in the milk, so a little inflammation may increase the number of bacteria very materially. I did not mention that but perhaps I should when I gave the sources of bacteria.

Member:—Is there much difference in the number of bacteria in the milk drawn at first and that drawn in the last stage of the milking process?

Mr. Lane:—Of course naturally the first few streams of milk remove most of the bacteria in the udder and in the last milk drawn you may not find any bacteria at all. Certified milk dealers have taken advantage of that point and discard the first few streams of milk which contain the bacteria, throw it away, in order to have as few bacteria in the milk as possible.

Member:—I understood you to say, Mr. Lane, that you gave 40 points for flavor and 10 for appearance of package, but I did not understand how many points on the score card were given to bacteria, acidity and dirt.

Mr. Lane:—Flavor receives 40 points; next comes composition, which includes fats and solids not fat, which is given 25 points; then bacteria 20 points, acidity 5 points and appearance of package and contents 10 points, which make the 100 points.

Member:—This question may not be directly on this line, but I would like to ask if Mr. Lane knows any difference in the composition of skim milk after the cream is directly taken off by the separator in high testing milk that would test 5 per cent butter fat, and that from milk testing 3.60 to 3.80? I have heard it said that skim milk from a Jersey dairy was not as good as skim milk from an ordinary dairy.

Mr. Lane:—That is a chemical question, but I will say that the difference is not great. As far as the fat is concerned, there should be no difference, that is, if Jersey milk were run through a separator and the separator run properly, it would reduce the fats to .1 per cent and would do the same in Guernsey, Holstein or any other milk.

Member:—Is there any difference in the other solids?

Mr. Lane:—No great difference. Tables show variations both ways but there is not a great differnece. Some tests with which I have been familiar, sometimes run higher and sometimes lower, depending perhaps on the individuality of the cow.

Mr. Newman:—Mr. Lane mentioned the milking machine, I would like to ask if he finds the bacteria in milk produced by the milking machine were less in number than by hand milking?

Mr. Lane.—At the contest in New Hampshire, which was just two weeks ago, the milk drawn by the machine won first prize and also the cream from milk drawn by the milking machine won first prize in a contest where there were ten entries. That might not always hold good, it depends altogether on the care of the milking machine. In a dairy where the milking machine has been used, I have found bacteria up to three and four million and that same dairy, by properly sterilizing the milking machine, would get down to four hundred, so you see it is a question of cleaning the machine. It is possible to keep the bacteria down with the milking machine and it is possible to keep them down with hand milking, in either case it is a question of care.

Member:—I have been asked to give my experience. A good many years ago, as much as thirty years ago, to test the action of the atmosphere on milk, I sealed milk as soon as possible after it was drawn from the cow and cooled it down as soon as I could. I made butter from a quantity of milk secured in that way and submitted it to all the experts in the country at that time, and I found milk treated in that way would keep as long again as the same milk cooled just as cool and yet exposed to the air. I usually made my butter with open, deep setting cream, but the other was sealed as quickly as possible after milking and it would keep from souring as long again after that treatment and the butter was pronounced perfect as far as flavor was concerned. I do not know anything about the texture.

Mr. Lane:—The gentleman has brought up a good point. Sometimes we say we have to aerate milk in order to drive off the animal heat, the animal odor, and so on. There are no animal odors in clean milk, and the heat in milk is not any different than any other kind of heat. As the gentleman said, if we draw the milk from the cow directly into a clean bottle, seal it and

plunge it into ice water it will be all right and no bad effects will come from it; but if you seal that with dirt in it, or cow manure, or odors from the feed, or anything of that character, you are going to have trouble. Clean milk can be sealed immediately without any fear of spoiling because it was not exposed to the air.

Member:—Will milk drawn from the cow and immediately sealed before it is cooled be as good as that milk that is cooled without being sealed immediately, that is as far as flavor is concerned? Will the sealing before it is cooled have any effect on the flavor or keeping quality?

Mr. Lane:—If the milk is clean it may be sealed immediately and plunged into cold water, but the trouble is there is not much of the milk that is absolutely clean.

Member:—Is there not a big difference in the flavor of milk from different cows, just as it comes from the cows, the cows being all fed the same?

Mr. Lane:—Not very much. The difference in flavor would come largely from the difference in the amount of butter fat. Jersey or Guernsey milk with 4 or 5 per cent fat is a little pleasanter, a little smoother to the taste than the Holstein or Ayershire that runs low in fat, say 3½ to 3 per cent, and if I were scoring the two milks and they were both absolutely clean and one was rich in butter fat and the other lower in fat, I would invariably favor the higher fat being a pleasanter flavor.

Member:—With the surroundings of the ordinary dairymen, where the cans are closed and not cooled immediately, would there be any difficulty in regard to the bacteria in milk, or would the flavor in the milk be affected in that way? We are told sometimes it is better to leave the cans open and stir the milk, that milk well stirred while cooling is better than milk well cooled and not well stirred. What is your opinion of that?

Mr. Lane:—It is impossible to smother milk but if the milk is not clean and you shut it up without cooling, then you will get the smothered flavor which comes from the dirt and bad odors of the milk, bad odors that have been thrown off. If you take milk that perhaps has a little odor of the cow stable and run it over the cooler, you will get rid of some of it and the mere fact that you have cooled that milk makes it possible for you to seal it up as tight as you please. Milk, even though it is slightly

off flavor, if cooled, can be sealed immediately and remain so, but if it is not cooled and you shut it up close you get that smothered flavor. It will show up every tme in testing for flavor and this could be avoided by stirring the milk or running it over a cooler, and I prefer the cooler every time because you not only get the effect which you have from stirring this and driving off any bad odors, but you cool it much more quickly. I realize a good many of you have not these patent coolers and have to resort to this method of setting the milk in ice water and stirring it. If it is put in cold water and thoroughly stirred the temperature can be put down to 60 which is fairly good, but if it is run over a cooler you not only get the effect you would by stirring but the additional benefit of bringing to a low temperature. Does that answer your question?

Member:—In part. I know of dairymen who close their cans just as soon as they are full, the covers are put on tight, and then they wait until all the milk is drawn before they remove the cans from the barn. I do not believe they can make as good flavored milk in that way as they could if they took it immediately, as soon as one can was filled, and cooled it down, leaving the can open.

Mr. Lane.—You are right, if the milk is not clean.

The Chairman:—We will have to bring this discussion to a close and take up the next topic on the program, Lessons From the Butter Test, H. J. Credicott, Butter Government Inspector of Chicago.

LESSONS FROM THE BUTTER TEST.

Mr. H. J. Credicott, Chicago.

Mr. Chairman, Ladies and Gentlemen:—

In discussing this question of lessons from the butter test, we might discuss it from two standpoints, the lessons we have learned and the lessons we may learn. I do not think we have ever gotten as much out of the butter tests as we could have, we have been looking at them from a wrong view point. The butter tests were first started in connection with fairs and conventions

to give the buttermakers an interest in the contest part of it, that is to get into a contest for prizes, and that is a very good thing. We have to have something to arouse interest along that line, but a great many buttermakers come into a contest only for that feature of it. We find this is shown very plainly when a contest is purely educational. A contest at a convention, where there are prizes, considerable premium money and perhaps a gold medal, will have a larger exhibit than one which is run on purely educational lines. That I have noticed very plainly in this state. I have been scoring butter for the state dairy and food department in an educational contest where no prizes, of any consequence, are awarded; there may be a few small prizes given but nothing of any great moment. It is a contest simply for educational purposes and they have had from twenty to twenty-five tubs in each contest I believe the past summer, while in the contest in this convention, where there is some prize money, there are over twice that number of tubs.

If the buttermakers only realized the chance that it gives them to find out exactly the kind of butter they are making and how their product compares with that made by the other buttermakers in the state, they would go into this matter from an educational standpoint. A buttermaker who wants to improve himself and find out the best methods of handling his product, should not miss an opportunity to go in an educational contest. In looking over the ranks, we find the buttermakers that have come to the front and have become really expert makers are the ones that have always taken advantage of the scoring contests that were carried on, and there are a few, quite a few, who will sit back and say that the score is all humbug and that the contests are simply "graft." Those men are usually nonprogressing, men satisfied with the methods used ten or fifteen years ago and who will not admit that we are progressing in the art of buttermaking, and I do not know that it would do them any good to come into the contests because if they did they would not accept the score as indicating the true condition of their butter.

I saw a case not long ago, where one of these old buttermakers had made a lot of butter for a contest this year in another state, where I happened to be scoring the butter, made his butter from one day's old milk. He had taken a great deal of trouble with it, the butter being made from the morning's milk, which he

had taken separately and made it into butter, had a small amount of it made up with a hand churn, and he was absolutely certain that butter was going to win a prize. He got a score of 92 and instead of trying to find out where he made his mistake and why he did not get the score which the quality of his milk encouraged him to believe he should have had, he said the scoring was no good, the judge did not know his business, and he dropped out. I venture to say that man will enter no more contests.

There is one thing, of course, that the buttermaker is always interested in, and that is the ability of the judge to score the butter properly. He feels a great many times, because the score of the butter judge and the score of the man who buys his butter, is not the same that the judge is making a mistake. Now you must remember that those two men are looking at the question from a different standpoint. The butter judge, who is scoring butter at a contest, is doing it in a critical manner, looking for defects to point out to the buttermaker so he may improve. The butter dealer in the market is looking at it from a financial standpoint. If the market is firm and butter is in good demand, a piece of butter which on critical inspection would not score over 90, will sell readily as extra. The butter dealer of course does not want to hurt the feelings of the shipper and he gives him a score according to what he can really get for the butter. If he can sell it for extras he will give him a score of 93, and it is this thing which has caused so much dissatisfaction with the scoring contests. The butter dealers who have given this any attention will admit this fact as readily as anybody else, but nevertheless, I do not think a butter judge should pay any attention to matters of that kind. In scoring butter, he should try to strike an average of what the butter will ordinarily sell for. I know there is a great difference in the market value of butter at different times according to the supply of butter there is on hand. At one time a piece of butter may sell as first and very slowly at that, so it seems to be a hard matter to set any score which will at all times represent the commercial value of butter.

In connection with that, I might say that the butter judges are learning many things from these contests. They are finding how hard it is to go through a lot of butter twice and set the same score. Butter judging is simply a matter of comparison. The butter judge has a standard of some kind of butter, usually

butter which we call extras, the average butter scoring about 93, and in scoring butter he is comparing all butter with that, it is either a certain amount better or poorer than that. In comparisons of this kind, the judge is liable to be influenced by the preceding tub, be it poor or good, and in this way the judges are learning to watch their work more closely. I believe our present system of scoring will have to be changed to meet this condition; I believe we will have to adopt some system of scoring similar to that used in Denmark. In Denmark they score on fifteen points, with a variation of from 11 to 14 points, simply dividing them into grades. Based on our system of scoring, a first grade would cover butter from 95 points up, a second grade would cover butter from 92 to 95, the third grade from 89 to 92 and the fourth from 86 to 89, and this would about cover the commercial differences in butter in our market today and I believe with this system it would be possible for the different judges to do more uniform work, work more satisfactory to the buttermakers. This is only an idea talked of among a few men judging butter, and I have given it to show that we who are judging butter are trying to progress as well as the men who are making the butter.

In regard to the lessons which have been learned from the butter tests, I would like to refer to the state from which I came, Minnesota. For several years in Minnesota we have had a monthly contest, conducted by the dairy and food department. The buttermakers have gone into it very largely and have received a great deal of benefit from it. I speak as one who formerly was a participant in those scoring contests and personally received a good deal of benefit from them. The buttermaker has an opportunity to try different methods of manufacture, each buttermaker has to work out the method which will give best results with the machinery he has to work with, and there is nothing which will help him more than to enter these contests. He can try different methods, compare them with the results secured from other methods, and see whether he has gained or lost. To get the full benefit of this the scoring must be done by men who are expert buttermakers themselves and can point out the probably cause of the defects in the butter and thus help the buttermakers to remedy them, and the full benefits will only be secured by a complete report of the methods used in making the

butter sent in to the judge, so that he can examine the buttermaker and point out to him what was the probable cause of the different defects in his butter. That has been the system followed in Minnesota for the past two or three years and longer than that, and the result has been shown in the high average score which that state has obtained on entering into competition with other states. This was done largely through the observation of the men who are acting as butter judges and critics, who compared the methods used and found which methods seemed to give the best average results and they carried this knowledge around among the buttermakers.

One of the most important things they learned was the more quickly cream is turned into butter after being received at the factory, the fresher, cleaner and sweeter the butter was and the longer it would keep. I can tell you now the success of Minnesota in the scoring against other states is that they have followed largely a system of churning the cream the same day as received. The men who won the high scores for Minnesota, who can always be depended on to get a score higher than 94, follow that system almost altogether. Of course there are exceptions, occasionally a man gets a high score from cream held until the following day, but the majority of butter is manufactured from cream churned the same afternoon as received. As Mr. Lane has been telling you in his talk on milk, every hour the milk is held bacteria are developing. Some produce flavors we want in butter, the acid flavor, some are harmful and produce harmful flavors, making the milk stale and unclean in flavor and such flavors are transmitted directly to the butter, so it follows the more quickly you can get that cream turned into butter the sweeter and cleaner our butter is going to be.

The taste of the consuming public has demanded an acid flavor in butter, which can only be secured by development of acidity in the cream. In order to do this, it has become the custom to hold the cream over night and at this season of the year it was quite common at one time to hold cream two days before churning. If you desire butter with an acid flavor, you can secure it by use of a heavy starter made from pure pasteurized cream, inocculated with pure live acid culture. By using a large amount of this starter and ripened cream you can get all the acid necessary at the present time. This should be done in a few

hours. It is possible to churn the day the cream is received and by this method you will find there is a great difference in the flavor. This is the only solution of the trouble with the separator cream, which they are having in some localities. I have in the past season seen samples of butter from creameries receiving all separator cream, which was more or less contaminated, old and stale before it reached the creamery, and bv churning this cream up quickly as possible after it was received, they made an improvement of anywhere from two to five points in the grade of their butter. Of course there are some objections to this. A butter which is churned up so quickly is more delicate in texture. The development of acidity in cream seems to have a tendency to coarsen the texture of butter and this butter from fresh cream is more delicate and requires more delicate work than butter not made from such fresh cream, but by careful attention to the churning and working of the butter, this difficulty can be overcome.

In regard to the butter which is entered at this contest, I would say that the most common faults seem to be a greasy or overworked body. This gives the butter a greasy flavor, and when a greasy flavor is developed in butter it covers up any good qualities the butter may have. I have watched that point for the past year in my inspection work in the Chicago market, and I find that a piece of butter which is greasy in flavor very seldom has any very high flavor, in fact it is liable to be what we call flat or lacking in flavor and character, that it has no distinctive good flavor, it is simply a flat, tasteless piece of grease. That can be overcome by handling the butter in such a way as to get good texture and being careful to get just the proper amount of salt. Very often a butter has been handled in such a way as to make it greasy or tallowy and it will be low in salt also, and this helps to give that flat, greasy flavor and lack of character. I judge that this defect in the butter in this contest is largely due to the churning temperature. Some of it seems to have been washed at a very low temperature, so it required an excessive amount of washing to incorporate the slat. Some of it was churned at a low temperature and washed with water with too warm a temperature, which has a tendency to make the butter flat and also make it greasy. Some of it seems to have been churned and washed at too warm a temperature, thus making a leaky butter.

There are two or three tubs that are quite leaky and appear to have been churned at too warm a temperature.

There is a small amount of mottled butter. It is not very bad for this time of year. The mottles in the butter are due to uneven distribution of salt, the salt seems to have some action on the color of the butter. The chemists have not yet explained this satisfactorily, but nevertheless it is true that the salt does act on the color of the butter in some way. Where the salt is heaviest the color will be the darkest, so it is necessary to get the salt evenly distributed. In order to do this, one should be careful to distribute it evenly throughout the churn and it is well to revolve the churn a few times before putting the rollers in gear so the salt is distributed throughout the butter before commencing to work it. It also helps if the salt is moistened before it is added to the butter, so the crystals are broken up and will dissolve more rapidly.

The main defects in flavor in this butter are what we term commonly "stale cream flavors" and wintery flavor. The wintery flavors seem to be due to the cattle eating frozen feed which gives the butter a peculiar, bitter flavor. The stale cream flavors, as I said before, are mostly due to the milk or cream being held too long before it is made into butter. This may be on the farm or at the creamery after it is received and the only remedy is to get it to the creamery and have it made into butter before these flavors develop.

That, I think, covers the main defects in the butter in this contest. At the present time there is in the market a growing tendency to pay for butter according to quality and I believe we are going to see the time in the future when butter will be paid for strictly according to quality. Those who are watching the market situation will notice now that there is a wider range between the quotations on firsts and extras than there has been for a number of years, and I believe at the present time in Chicago there is a difference of from two to three cents between the quoting price of firsts and quoting price of extras. A year ago there was very seldom a difference of more than one and a half cents. This shows there is an improvement that way. Of course it is brought out more strongly at the present time because there is so much poor butter on the market that is is spoiling the demand for butter and this necessitates a lower price for the poor butter,

but I heard yesterday that one of the largest butter firms in the country is starting out to pay for butter strictly according to quality. It is starting this with one state as an experiment and if the plan works out favorably no doubt it will be extended to other states. I believe the plan, as they are trying to work it, is to have a certain price agreed upon for a certain grade of butter. For instance, 92 butter is to be the standard and the quotation of extras will be paid for that butter; for each point above that one half cent more will be paid and for each point below that there will be a cut of one half cent in the price. It is a question how this will work out but believe there are chances for improvement along this line, and if we do get a recognition of quality in this way it is going to do a great deal to improve the average grade of our butter.

It behooves the buttermaker to take advantage of every opportunity to exhibit his butter, find out the defects and get it up to the standard. He should do that not only for the immediate financial returns but because a good quality of butter is necessary if we are going to hold the trade that we now have. The butter consumer does not like to get this bad flavored butter and if he once begins to use oleomargarine, which is always fairly sweet and good, unless he has some scruples against the use of that article, he is liableto prefer it to butter, which may be good one week and poor the next.

I do not know that I have anything more to say along this line. I believe that the buttermakers are going to wake up to the possibilities of this thing. We shall see more of them in the contests in the future and shall see more of these contests conducted. I thank you.

DISCUSSION.

The Chairman:—Has anyone any question on this subject?

Member:—I would like to ask about mottles in butter. Mr. Credicott, do you consider mottled butter due to unequal distribution of salt or to the salt not being dissolved?

Mr. Credicott:—I think it is due to the uneven distribution of the salt. If the salt were not properly dissolved it would probably be harder to get it evenly distributed but we often find quite a badly mottled piece of butter which does not show any undissolved salt.

There seems to be quite a difference of opinion in regard to these mottles. I read a bulletin the other day in which it was claimed that the white spots in the butter were due to the fact that the buttermilk was not properly worked out, but I think that statement is not exactly correct for I have noticed that a piece of butter colored to a certain shade and different amounts of salt worked in, there will be different degrees of color according to the amount of salt the butter contains. We can change the color of the butter from golden yellow to brick red according to the amount of salt in it.

Member:—How much difference in price is there between a year ago and the present time?

Mr. Credicott:—A year ago the difference in quotations between firsts and extras was about a cent and a half, at the present time it is closer to three cents.

Member:—Would the temperature of the salt have anything to do with mottles?

Mr. Credicott:—If the salt is stored in a cold place so it is lower in temperature than the butter it would not dissolve readily. I think it better to warm the salt to the same temperature as the butter before it is used.

Mr. Newman:—You said you would advise moistening the salt. How would you distribute that moisture?

Mr. Credicott.—I would distribute it as evenly as possible through the churn and before putting the working rollers in gear I would revolve the churn eight or ten times to get it thoroughly mixed in. I want the butter in a granular condition, about the size of wheat kernels or a trifle larger, so that in revolving the churn I would get the salt mixed thoroughly through it before the working was started, then the crystals of the salt which were softened up would dissolve very readily.

Mr. Newman:—Have you tried salting with brine in place of dry salt?

Mr. Credicott:—I have never had any success with it. The reason that I favor moistening the salt is more on account of the working than the color. It is possible to get an even color very easily with dry salt if care is taken to have it evenly distributed, but by using moistened salt it is not necessary to work the butter so much and dry salt has a tendency to break up the grain of the butter to a certain extent, and I am opposed to breaking the grain

of the butter if it can be helped because it makes the butter greasy.

Member:—In moistening salt for butter, is it not necessary to use more salt?

Mr. Credicott:—It takes a little more, not a great deal. You see you have to have enough moisture in your butter to dissolve that salt when you put it in dry, and by moistening your salt you are simply wetting that butter and you can get a trifle more moisture in your butter under the same conditions.

Member:—Would you weigh the salt before moistening it?

Mr. Credicott:—Yes, and you may find it will require a pound or two more. I did some work in Minnesota helping a creamery on a matter of over-run and I believe on a seven hundred pound churning it required two or three pounds more salt, there was some washed away in the brine. The method used was after washing the butter to let it drain thoroughly, then add this moistened salt and pour about one gallon of water to 500 lbs. of butter, shut the churn and work it, and the salt which was dissolved was in the shape of granules so we got results from that and it was found we could get the salt thoroughly incorporated with less working and get a better grain in the butter in that way.

Member:—Why do you think there is a greater difference between firsts and extras now than there was a year ago?

Mr. Credicott:—Some gentleman connected with the market would be better fitted to explain the various factors, but I think the main reason is because the consumer is objecting more seriously to the poor butter, and there is a great deal more poor butter on the market. The system which has operated for the last two or three years of paying nearly the same price for poor butter as for the good article has had this effect. The creamery man could not get enough more for his butter to pay him for the trouble he had to take to make a better quality and he could not pay the farmer more for a better quality of cream, so the result has been a gradual deterioration in quality of cream and consequently in quality of the butter made. A prominent butter dealer in Chicago told me a short time ago that he did not think over seven or eight per cent of the current receipts would grade extras, so you see that the large quantity of poor butter thrown on the market must have some effect on the quotations because there is a limit to the amount of this kind of goods that the public will buy.

Mr. Lee:—I would liffe to ask Mr. Credicott a question. If you had a large vat of cream with the proper amount of acidity, separate that cream into two lots, churning one lot say in two hours after it had been cooled and the other cool to a temperature sufficiently low so the next morning it would have the proper churning temperature, do you believe the two lots of butter made would show any material difference when sold or put in storage?

Mr. Credicott:—It has been my experience that they would. While I do not like to talk about my own work particularly, I started in buttermaking with a determination to succeed, to get high scores and make a reputation for myself, and I do not believe any buttermaker ever worked harder along that line than I. I used to churn by the most approved methods, used a starter and ripened my cream to the proper degree of acidity, cooled it at once to a temperature below 50, but I was unable to get the uniform high quality of butter which I wanted. After I adopted a system of ripening the cream quickly, cooling it down and holding from one to two hours to get a good solid body and then churning it up, I was immediately successful in getting higher scores and a more uniform quality of butter. I have seen that experience duplicated in hundreds and hundreds of creameries, and in nearly all of the hand separator cream factories where I have had any correspondence with the buttermakers I have advised them to churn cream quickly as possible after being received, and there has been a material improvement in the flavor and quality of the butter from those factories.

Mr. Lee.—The only way we could really get any definite data on that would be on experiments conducted on that plan. We might suppose the butter was better but other conditions might have caused that improvement. A question of that kind would be settled where there was exact data by handling the same vat of cream. Advocating the churning in the afternoon would be of disadvantage to the buttermaker by affecting the body of the butter.

Mr. Credicott:—It does not need to affect the body, it is simply a matter of getting the churning temperature low enough.

Mr. Lee:—We realize that is true but is not this true that if we give a man an inch he takes six inches if he gets the chance?

Mr. Credicott:—That perhaps is true, but I think, Mr. Lee, when you leave the cream to be held over night, if your raw

material is so good that there is nothing in the cream to produce bad flavors you may get as good results by holding it over night; but the average raw material in most of the factories is rather defective and if it is held over night there is bound to be a development of bad flavors. We cannot get the temperature low enough to stop the growth of bacteria; we do get it low enough to stop the growth of lactic acid bacteria but other bacteria will produce their flavors at a lower temperature, and age I believe is the prime factor in the poor quality of butter we have.

Mr. Lee:—The discussion of this subject I will take up in my talk tonight with some data we have on that.

Member:—You spoke about churning cream as soon as it comes in. Do you advise churning cream as soon as it is ripened and cooled down, or to hold it?

Mr. Credicott:—I would hold it long enough to secure a good body, that is to get the butter fat thoroughly cold. When you cool cream, for instance, to a temperature of 50 degrees, then allow that cream to stand an hour or an hour and a half and it will show 52 or 53 degress, which is due to the fat being in small globules and not being thoroughly chilled throughout. If you churn in that condition the butter is liable to be greasy or oily in flavor and have a poor body. It should be held long enough so the fat is thoroughly cold and that will depend on how low a temperature you use, the lower the temperature the shorter the time needed to hold it. In fact I have done some work churning absolutely sweet cream, that is cream not ripened, but starter was added to get better flavor. I have started to churn in from fifteen to twenty minutes from the time the last cream left the pasteurizer and secuerd what I consider a perfect body, but I had excellent cooling facilities and churned at a temperature of about 46 degrees. It is possible to get good body in that way. If the cream is in a ripened condition it may be necessary to hold it two hours and under some conditions longer.

Member:—Was your yield just as good?

Mr. Credicott:—If you churn at low enough temperature so as to get exhaustive churning, it has no effect on the yield.

The Chairman:—I will appoint the committee on membership:

Messrs. C. J. Gilkerson of Marengo, J. B. Newman of Elgin, Andrew Fredericks of Elgin.

The Secretary.—If the members of the Illinois Butter-makers' Association will wait a little while, the Secretary, Mr. J. B. Newman, wishes to meet them. There is plenty of time to hold a short session of that association here this afternoon.

I also wish to call your attention to the excellent program we have for this evening. Professor Lee of the University of Illinois, Professor Erf from Ohio, and Mr. Nelson of Camp Point are on for addresses and the music will be furnished by Mr. Lumbard, whom most of you know. To those who do not know him, I will simply say that he is a man eighty years old. He was famous in war times with his brother Frank as a member of what was known as the Lincoln Quartette, a quartette that sang during the Lincoln-Douglas campaign. He is a famous singer, a fine old man, and he will sing for us tonight, as will the Marengo High School Glee Club and the Marengo Quartette.

The address tomorrow morning will be by Mr. O. C. Gregg, Superintendent of Farm Institutes in Minnesota. Mr. Gregg is a breeder of dairy cattle from a practical standpoint; he is a farmer, like a good many others, a dairy farmer. He is a thorough believer in raising his own dairy cows and he has had an experience that extends over thirty-five years and I hope he will have a large attendance of dairymen here to listen to him tomorrow.

The main feature tomorrow night is the banquet, which is to be given by three church societies of Marengo. This is an entertaining feature of your convention and we hope to see you all in attendance.

Meeting adjourned.

Tuesday Evening Session.

Meeting called to order at 8 o'clock, Vice-President J. P. Mason in the chair.

The Chairman:—We are fortunate in having with us this evening Mr. Jules Lumbard who has sung for this Association for the past thirty years. I take pleasure in introducing to you Mr. Lumbard.

Mr. Lumbard sang a solo, "Over the Ocean Blue," and in response to a hearty encore, "The Rosebush," after which musical selections were rendered by the Marengo High School Glee Club.

The Chairman:—The next on our program is an address by Professor Carl Lee, Assistant Professor of Dairy Husbandry of the University of Illinois.

WHAT THE ILLINOIS BUTTERMAKER SHOULD DO IN THE CHURN ROOM DURING 1908.

The year 1907 has passed into history and one more year of experience has been added to the buttermaker's record. May I truly say that each Illinois creamery operator has balanced his books with the thought that he is better able than ever before to cope with some of the problems that are sure to be repeated during the coming year. If so I feel that the quality of our butter in 1908 will be improved.

The man who has conquered some of these difficulties is the one that deserves credit. Several things have happened in our creameries the past year that should not have passed unnoticed.

Attitude Toward the Patrons.

When we speak of the work to be done in the churn room is it necessary to say anything of the relation of the Buttermaker and his patrons? Yes, because the foundation of his work depends to a certain extent upon the man who produces the milk.

There are very few creameries in Illinois where the operator does not come in direct contact with his patrons. No one in a community can do more than he, in spreading dairy information. The farmer may want instruction regarding the care and handling of his cows. His milk or cream may not be up to the standard, and he needs help to bring about its improvement. He may want to learn how to test milk, that he may study the indi-

viduality of his cows. If the buttermaker can not give this information, he can not hold the respect and confidence of his patrons.

There is a community in this state, not in the dairy section, that organized and built a creamery. The first two buttermakers were a failure. The third was hired, and it took a year of hard work to bring the milk producers back to where they were when the creamery started. At the end of his third year one of the directors said: "This man is worth $150.00 a month, in fact, we can not do without him. Our business has more than doubled, our patrons know the why and wherefore of some of the dairy and creamery problems. Every pound of butter made this year passed the extra mark." If this man continues his work in that community the only thing that will prevent the Illinois State Dairyman's Association from meeting there sometime in the future, is the size of the town.

Is it not a fact, that the patrons that bring the best product and give you the least trouble are the ones who have obtained dairy information and I honestly believe that some of you creamerymen can recall when your patrons were given their first instruction.

The buttermaker should be just as firm on the quality of the raw material today as he has ever been. There should be no letting up on the discussion of such an important subject until we see an improvement. No one has yet invented or suggested a method by which this poor hand separator cream can be churned into butter that will pass inspection by the critical trade. Cream properly cared for even if two or three days old with a small amount of acid developed can be made into butter that will more than pass the extra mark.

The buttermaker should have a certain standard and all patrons should meet that requirement. It would be still better if all creamery men use the same standard and always consider quality first and quantity second. Not all of the creameries in the state receive the same grade of cream. Is that difference due entirely to the patrons' attitude towards cream production, or has there been some other force at work? It is evident that this other force is education.

Much has been said regarding the handling of the cream in the creamery. Many operators may have methods that prove

satisfactory in their creameries. No fixed rule will give the same results regardless of locality. However, we believe that if a number of our buttermakers would make a change, there would be a noticeable effect upon the quality of the butter. If there is a decrease in the grade of Illinois butter it is not altogether due to the grade of milk or cream that is received. Part of it at least can be traced back to factory methods. Patrons without defence have sometimes been made to take more than their share of the blame for the low grade of butter. Not all of our whole milk creameries can say that their output passed the extra grade. This is also true of our creameries handling farm skimmed cream.

I am sorry to say that since there are patrons here and there who deliver off flavored goods, it has made a number of our men more careless. They can use that as a shield when anything is said regarding quality. Let us forget the past and during the coming year follow this plan. Set your standard for quality high. Give instruction to the careless patron and if the quality of his milk or cream is not improved, reject his product. After the cream is in your charge handle it in such a manner that the best possible butter can be made from it. Use a liberal amount of starter and be sure you know how to make it. Why use a starter? Because there is not another thing that will show such a beneficial effect upon the quality of the butter. Many say, the cream is already sour and no starter is needed. This is a wrong idea. The starter is added not only to help increase the acid but to improve the quality.

A short time ago some one from a neighboring state said that better butter would be made today if less starter was used. That is not the fault of the starter. If you can not make a starter, learn how.

Our suggestive plan for the fall and winter months is to ripen the cream in such a way that the desired acid can be developed in as short a time as possible, without employing a higher ripening temperature than 75 degrees F. Use judgment as to the amount of starter to be added. When it is not crowding the capacity of vat or churn and the average test of cream is low, enough starter or selected milk may be added to lower the fat content to 20 per cent. During ripening, the cream should be agitated frequently and the cooling begun when there is enough

acid developed. Usually during the warmer season of the year there is an abundance of acid present when the cream is delivered. The starter should be added immediately. An hour later the cream should be cooled to a temperature sufficiently low for churning.

When Should the Cream Be Churned?

This will depend upon factory conditions. There is no fixed rule as to how long the cream must be held before churning, other than this. It must be held long enough at churning temperature to produce the desired firming of the butter fat. The method employed in whole milk factories is to hold the cream until the following morning. This has been followed in the hand separator factories. Where they have not the proper facilities for holding the cream, for any length of time without its being changed by the room temperature, it seems possible that a better grade of butter might be made by churning the cream two or three hours after it has been cooled. With good vats there is no change in quality, whether the cream is churned in the afternoon or the next morning. The above conclusion was obtained by four different judges, scoring 100 tubs of butter, 50 of which were churned in the afternoon and 50 the following morning.

The only serious objection to holding the cream for the short period is that it is apt to be overdone and the cream not allowed to stand long enough at the desired temperature. This will not show itself in the flavor but rather in the body.

The Churning of the Cream.

The two most important factors in churning are—the temperature of the cream and size of granules. The first is changed with the seasons and the length of time that the cream is held cold. The granules should be just large enough to permit the handling of the product in drawing off the buttermilk and washing off the butter without any loss.

It is not safe to state just what temperature should be employed in churning, other than this. The butter should at no time be in a slushy condition or so soft that the granules do not remain more or less separate. That does not mean that the temperature must always be 50 to 52 degrees, but it would be better

if it could be fairly constant. For our state there can be a difference of from four to six degrees in churning temperature between winter and summer.

Washing of the Butter.

All of the buttermilk should be allowed to drain off. Then add a small amount of water distributed evenly over the butter. Allow this water to drain off. Add about the same amount of water to the churn for washing as there was buttermilk drawn off. The temperature of this water should be governed by the temperature of the cream. In our work we find that the best results are obtained when the temperature of the buttermilk and wash water correspond. Do not infer from this that you can churn at a temperature that will leave the buttermilk 62 degrees or over and in that case the wash water must have the same temperature. After the wash water has been added revolve the churn ten or fifteen revolutions and immediately allow the water to thoroughly drain off. While this last water is passing off, the salt must be evenly distributed over the butter and the working begun. First revolve the churn on slow gear about ten times, then allow to stand fifteen minutes before the working is commenced. It is difficult to say just how the butter should be handled to give the finished product its best appearance. Here the operator's judgment must be relied upon. The butter must not be under or overworked and the salt must be dissolved and evenly distributed. Follow the directions given for handling each particular make of churn, is the best advice we can give. In our work this past year we have endeavored to work out a method that could be put into general use in creameries and give the result desired. Aside from flavor the common faults found in butter in the markets are, butter overworked or underworked, body weak or slushy, color mottled or streaked. These faults are caused by defective workmanship. How can we overcome them? Salt will dissolve in presence of moisture and it is known that if there is a small amount of water present in the churn at the time of working it will materially help in dissolving the salt. This accounts for the practice of not allowing all of the wash water to drain off.

By this method the exact amount of water left in the churn could not be determined. Although a known amount of salt

was added each time the finished butter did not always leave the same amount of salt—as part of it was taken up by the surplus water. There seems to be a little less danger of injuring the body of the butter if excessive working is done in the presence of water. The surplus water does not have any tendency to increase the moisture content of the finished product providing the other details of the churning operations have been carefully watched.

The above facts being known there is no objection to adding a known weight of water per pound of butter. The amount of water to vary with the size of churn and amount of butter. The amount of salt to be used is figured on the same basis.

Results show that marketable butter varies considerably in salt content. Average butter should contain 2½ to 3 per cent of salt. When the work is under control it is easier to get uniformity. Therefore a plan can be worked out to suit individual creameries. In our creamery when the regular work is done this plan is followed.

For every pound of estimated butter in the churn add 2½ oz. of salt and one-fourth of a pound of water. Close the churn tightly and revolve 10 times before starting the worker. Then work the usual number of revolutions. 20 to 30 with the Disbrow and from 12 to 16 with the Victor, etc. The only objection found to this method is that salt is wasted. We feel that it has been more than repaid when the other advantages are taken into consideration.

As the investigation progresses other ideas, pro and con, may be brought to light. Results and details of this investigation will take up too much of our valuable time, but we wish to state these facts. The above method was used in the making of 108 tubs of butter for this season's work on pasteurized and unpasteurized butter. In nearly every churning the number of revolutions the butter was to be worked was stated before the working commenced. Not a single tub of butter showed defective workmanship. The average composition of the butter—samples taken from churn were as follows:

Water per cent, 13.92; Fat per cent, 82.56; Salt per cent, 2.93; Casein per cent, .76.

Table I.

Date.	Water %	Fat %	Salt %	Casine %
August 3	13.59	83.03	2.23	1.15
August 6	14.15	81.98	3.09	.78
August 7	15.31	81.40	2.75	.54
August 10	13.85	82.74	2.53	.88
August 9	13.91	82.13	3.15	.81
August 13	14.34	82.10	2.87	.69
August 14	14.34	82.33	2.64	.69
August 16	14.25	82.70	2.26	.39
August 17	12.96	84.44	1.96	.64
August 19	14.84	80.55	3.78	.83
August 20	14.60	82.17	2.57	.66
August 23	13.82	83.19	2.22	.77
August 24	14.19	82.95	2.17	.69
August 27	14.64	82.14	2.56	.66
August 28	No record			
August 30	14.02	82.79	2.41	.88
August 31	14.08	80.82	4.54	.56
Average	14.18	82.46	2.67	.72
Highest	15.31	84.44	4.54	1.15
Lowest	12.966	80.55	1.96	.54

August 27 to October 23, different work was taken up. Work turned over to a new man on October 23 with the instruction to make all of the butter by the method of adding water to the churn. Other details were explained. Average composition of the butter made from that time until November 23 when the work was done by the special course men, is as follows:

Date.	Water %	Fat %	Salt %	Casine %
October 23	14.98	81.47	2.60	.95
October 24	15.23	81.43	2.31	1.13
October 26	15.58	81.01	2.19	1.22
October 29	15.46	81.36	2.14	1.04
October 30	15.91	81.03	2.12	.94
October 31	15.36	81.30	2.47	.97
November 2	15.39	80.19	3.70	.72
November 5	13.78	83.75	2.09	.34
November 6	15.44	81.86	2.36	.34
November 8	14.71	81.87	2.46	.96
November 11	No sample.			
November 13	16.63	77.80	4.46	1.14
November 15	14.76	82.29	2.17	.78
November 16	No sample.			
November 19	14.86	82.96	1.52	.66
November 20	15.04	82.22	1.99	.78
November 22	15.61	80.62	2.87	.90
November 23	16.31	80.34	1.60	1.75
Average	15.31	81.34	2.44	.91
Highest	16.63	83.75	4.46	1.75
Lowest	13.78	77.80	1.52	.34

Uniformity of Product Necessary.

Every buttermaker's aim should be to produce butter that will suit his trade. Flavor is the most difficult part to control. Salt plays an important part, both in relation to quality and overrun. As stated elsewhere, the general demand of the market seems to be about two and one-half per cent of salt. Butter made in different factories bought by the same commission firm may vary 2 per cent. By all means salting should not be overdone, but to a certain point it is beneficial to flavor and keeping quality.

Body is the backbone of the butter. There is little excuse for a single tub of butter ever being made with that part of it defective. It is always within our control. Why is it, that today we hear some of the old butter men say? "Is it impossible for some creameries to make that fine, firm, waxy piece of butter that was once made? The cows are about the same, the feed and seasons have not changed." Some are sacrificing the body that they may sell more water. I have no sympathy for the man who makes this a practice and much less for the one who advocates it.

This brings us to the subject: What is butter made of? Is it known just what proportion of water, fat, salt, casein and ash shall constitute a tub of butter? Do any of them bear any direct relation to quality? This is a subject for investigators to settle and until then we must be content in making a product that is sold on the merits of its quality.

The law has passed the limit of water as 16 per cent. The fat is the basis on which all creamery calculations are figured. It is also the food value of butter. It is bought principally because it contains butter fat. It would therefore seem absurd to place the legal limit on anything but fat. We hope that the time will come when that change will be made.

Every Illinois buttermaker should be interested in knowing what he is doing with this valuable product every day placed in his charge. Not only to see it made into butter of finest quality, but each patron is credited with no more nor less than what is his, that the loss in handling be reduced to a minimum.

We have the Babcock test for the fat content and we have the moisture test for water, salt also is within determination. After all, the results depend upon the knowledge and applica-

tion of method. It is our occupation to promote methods, and we were in hope to give the Illinois buttermakers at the convention, some definite data concerning that question, attracting more attention among us than any other one. This applies to the control of the composition of butter. In the past year we have analyzed 1,300 samples in duplicate, making a total of 2,600 separate analysis. These comprise over 500 samples taken at intervals in the general butter market. Over 100 samples taken at various places throughout this State and Iowa, where the method of making was under our personal supervision. Nearly 700 of these samples represents the butter made under experimental conditions. In these Tables, and others, we have material which if applied will aid in the solution of this distressing problem.

TABLE 3.

Showing Comparison of the Composition of Butter in Two Consecutive Churnings. Also Showing Variation in Samples Taken From Same Churn.

Churn 1.

	Water %	Fat %	Salt %	Casein %
	15.87	79.35	3.81	.97
	16.36	78.16	4.43	1.05
	15.43	79.78	3.72	1.07
	16.41	78.56	4.17	.86
	16.11	78.98	4.15	.75
	16.77	77.66	4.55	.82
	15.60	79.02	4.41	.97
	15.47	79.79	3.62	1.12
	15.48	79.68	3.88	.96
Average.....	15.94	79.00	4.08	.95

Churn 2.

	Water %	Fat %	Salt %	Casein %
	14.76	82.29	2.17	.78
	14.32	82.72	2.40	.56
	14.23	82.75	2.28	.74
	14.83	81.96	2.63	.58
	14.39	82.57	2.26	.78
	14.95	81.77	2.24	1.04
	14.54	82.33	2.09	1.04
	14.36	82.59	2.07	.98
	13.84	83.33	1.96	.87
Average...	14.47	82.48	2.23	.82

TABLE 4.

Showing Composition of the Butter when Samples Are Taken from the Churn as Compared with Taking Them Two Days Later From the Tub. Average of 56 Churnings.

	Water %	Fat %	Salt %	Casein %
From Churn	13.92	82.56	2.93	.76
From tub	13.03	83.52	2.70	.78

Comparison of Water in Worked and Overworked Butter.

Worked.	Overworked.
13.60	13.38
13.40	13.02

TABLE 5.

Result of Analyzing Butter From 46 Creameries. All of the Samples Obtained in the Market the Same Day.

	Water %	Fat %	Salt %	Casein %	Possible overrun allowing 2 % for loss.
Average	13.22	83.82	2.18	.78	16.9
Highest	15.46	87.25	3.50	..	12.3
Lowest	10.28	81.47	.86	..	20.3

Average by States.

	Water %	Fat %	Salt %	Casein %	Possible overrun allowing 2 % for loss.
Iowa—10 creameries	13.88	83.21	2.11	.80	17.7
Minnesota—20 creameries.	12.85	84.03	2.40	.72	16.6
Wisconsin—10 creameries.	13.10	84.11	2.08	.71	16.5
Illinois—5 creameries	13.57	83.98	1.75	.70	16.7

One creamery location not known.

TABLE 6.

Table Showing Water Contents of Half Worked Butter.

From 23 Churnings.

Half Worked.	Worked.	Half Worked.	Worked.
15.14	15.27	14.19	13.64
13.76	14.27	14.16	13.68
14.51	13.24	13.66	13.79
13.92	13.41	14.08	14.03
13.41	13.73	13.38	14.05
13.41	14.18	13.17	13.30
13.17	13.60	13.41	13.64
13.46	13.71	13.17	13.30
13.22	13.40	14.48	13.74
13.99	13.27	13.49	13.39
13.51	13.76	14.38	13.53
13.60	13.22	.....	.....

Average half worked, 13.76 Average worked, 13.70.

The Tables shown are representative examples of results and need no further explanation.

The next Table shows that there is no constant relation between fat and water and in order to know the overrun the fat determination must be made.

TABLE 7.

Each Lot Represents Two Samples of Creamery Butter Collected on the Same Day.

	Water %	Fat %	Salt %	Casein %	Possible overrun allowing 2 % for loss.
	Water %	Fat %	Salt %	Casein %	for loss.
Lot 1	13.42	79.88	.....	.....	22.6
Lot 1	13.42	83.56	.....	.....	17.2
Lot 2	11.84	84.02	3.50	.04	16.6
Lot 2	11.81	85.01	2.03	1.15	15.2
Lot 3	13.42	82.73	3.10	.75	18.4
Lot 3	13.42	84.05	1.63	.90	16.6
Lot 4	14.43	82.22	2.50	.85	19.2
Lot 4	14.44	83.34	1.53	.65	17.6

TABLE 8.

Result of Analyzing Separate Samples Taken from a Factory Consignment of Butter as It Arrived on the Market.

December 5, 1907	13.02	84.39	1.96	.61	16.1

Date When Butter Was Made.	Water %	Fat %	Salt %	Casein %	Average overrun for each day.
December 5, 1907	12.88	84.21	1.90	1.01	....
December 5, 1907	12.45	84.87	1.86	.82	....
December 5, 1907	13.02	84.39	1.98	.61	16.1
December 7, 1907	14.25	82.57	2.11	1.07	....
December 7, 1907	13.88	84.10	1.20	.82	....
December 7, 1907	14.52	82.47	2.00	1.01	18.1
December, 9, 1907	14.91	81.81	2.46	1.02	20.00
December 11, 1907	15.05	81.94	1.94	1.07	....
December 11, 1907	14.95	81.91	2.09	1.05	....
December 11, 1907	15.94	81.12	1.96	.98	20.00
Average for the week....	14.18	82.92	1.95	.95	18.1

Song, "Child of the King," by Mr. Lumbard.

THE OVER-RUN.

The Chairman:—We will have one more address this evening, a paper by Mr. Louis Nelson of Camp Point, Ill.

Mr. President, Ladies and Gentlemen:—

The subject assigned me by our secretary is "The Overrun," but I read in one dairy publication that I was expected to tell something of my recent trip to Denmark. In regard to this I will only say that the question of getting a large overrun is not securing much attention in Denmark. The watch word over there is "quality" and I am particularly glad to emphasize that the superior quality of the Danish butter as well as the extensive dairying that is carried on in that country has been brought about through co-operation.

At first I hesitated to write a paper about the overrun question, as it is difficult to tell something new and interesting, inasmuch as this subject has received much attention in our dairy publications and has been discussed at nearly every convention.

The importance of obtaining a normal overrun cannot be too strongly emphasized; it is of vital interest to every creamery, to such an extent that the success or failure may depend upon that one thing.

So I think it is entitled to be assigned second place among the creamery problems, being superseded only by the quality of the product made.

It is only proper and right that the quality should receive the first consideration and ought never to be sacrificed for the matter of quantity. But the strong competition has reversed the case in many instances, so the first consideration is quantity and quality second; in fact I doubt that the matter of quality receives proper consideration in any creamery today, at present. I shall not attempt to point out whose fault it is that conditions are such; every one of us have our opinions as to where the blame should be placed.

Now experts disagree as to how large an overrun can be obtained legitimately; so please do not expect me to tell. If you should ask my opinion I should say from eighteen to twenty-two, the creamery receives whole milk or cream, or both. The overrun at Camp Point creamery for 1906 and 1907 has averaged a little over 20 per cent.

About one-third our receipt is hand separator cream. This overrun has been obtained without cutting the patrons test, short weight or having abnormal moisture in the butter. It is useless for me to state what constitutes the overrun, as everyone is familiar with what the term implies.

The overrun is influenced by many factors, mainly by the losses of butterfat sustained in separating the cream, the churning process itself and washing and working of the butter should not influence the overrun to a great extent if due and proper attention is given to the body and keeping quality of the butter. Dairy experts are unanimous in declaring that unless abnormal methods are employed in churning, washing, it is almost an impossibility to incorporate 16 per cent of water. And good, honest, commercial butter is the only grade that ought to receive attention. I believe it is possible to incorporate from 14 to 15 per cent of moisture if the cream churned at proper temperature, from 50 to 56 degrees, according to the season, and washed in water from two to four degrees warmer than the buttermilk.

Considering the mechanical losses sustained in skimming and churning, I think it safe to say that if the separators are run at proper and uniform speed and are in good repair, the loss in skim milk ought not to exceed .05 of 1 per cent. In testing skim milk we invariably find only a mere trace, but I think a chemical analysis would rarely show below .05 of 1 per cent. If cream is properly ripened and churned the loss should not be more than from .1 to .15 of 1 per cent. The losses sustained by cream adhering to vats or ripeners are so small that it can hardly be estimated if the vats are properly rinsed. In this connection permit me to say that the most sanitary and economical way of conveying cream from ripener to churn is the suction method, which insures against any loss of cream, as not a drop of cream need to be spilled.

The mechanical losses in whole milk creameries should not exceed 2 per cent and in hand separator creameries not more than 1 per cent if efficient work has been done.

Thus supposing that the obtainable butterfat in whole milk creameries is 98 per cent and in hand separator creameries is 99 per cent, we should have an overrun of from 18 to 22 per cent.

In the matter of overrun, it depends nearly altogether upon the skill and care of the buttermaker. If the machinery is up-to-

date and in good repair and the buttermaker has sufficient help to carry on his work as it ought to be done, he should rightly be held accountable for a low percentage of overrun. But no creamery company or employer ought to expect that their buttermaker should do his work properly if he is worked beyond his physical and mental capacity, and in that respect many employers are penny wise and dollar foolish. However, when the buttermaker is working under favorable conditions I can see no reason why his results should vary much from the percentage that I have mentioned. Creameries selling their products directly to the groceries or consumers and in this way eliminating the shrinkage should show better results than creameries that depend on commission houses to dispose of their goods.

In most cases a poor churn yield shows inefficient work of the buttermaker. He cannot shift the responsibility, as when the quality is involved. We buttermakers can always put the blame on the milk or cream whenever the quality is not right, although it might have been our starter that was not exactly right, or the cream was not cooled down to the proper temperature when it was ready; or even in some cases the factory was not in a sanitary condition. "Cleanliness is next to Godliness." We have an old doctor at Camp Point who is a very enthusiastic dairyman. He asserts that cleanliness in dairying is Godliness itself, pure and simple, and, as an evidence, he contends that one can eat a piece of strong or filthy butter and praise God at the same time.

Now, I am not trying to defend the milk producers, their transgressions are too numerous to mention, especially if they use hand separators. I am only contending that in many cases better butter could have been made if the milk and cream had received better care at the creamery.

In conclusion, permit me again to emphasize that while a large overrun is of the utmost importance, the quality should never be sacrificed in order to gain quantity. And if co-operative and centralizing creameries would make that a rule and include it in their New Year's resolutions, much good would be accomplished.

The Chairman:—We will now stand adjourned until 9 o'clock tomorrow morning.

Wednesday Morning Session.

Meeting called to order at 10 A. M., President L. N. Wiggins in the Chair.

The Chairman:—We had better start this meeting. We are a little late this morning, it seems to be hard for everyone to get here. I am sorry I could not have been with you yesterday but I was unavoidably detained at home.

I know you are all pretty well acquainted with Mr. Gregg, of Minnesota, and he hardly needs any introduction. Last year we were much pleased to hear from him while at Joliet but, unfortunately, his time was limited, so this year we have endeavored to give him a full morning. I take great pleasure now in introducing to you Mr. O. C. Gregg, of Minnesota.

IMPROVEMENT OF THE DAIRY CATTLE.

By O. C. Gregg, Lynn, Mass.

Mr. President, Ladies and Gentlemen:—

This morning I want to do my very best for your sakes and not for my own. I am doubly interested in the subject of breeding good dairy cattle. I had a strong desire to come here to this convention because I believe most firmly that I have had experience that if I can impart to you even in part it will do you a lot of good. I find a few here in Marengo that have known me for some time and I think they will tell you that I am known at home as a sort of a cow crank, but I glory in the name because to those who know me it means that I have made a success in the breeding of good dairy cattle.

We Must Reject Some Full Blooded Dairy Cattle.

I am doubly interested in this subject because I find so much of misunderstanding and ignorance concerning it. I know that a man who will talk to you as I will this morning is up against a great deal of opposition. There is a certain per cent of the breeders of dairy cattle who do not like to hear me talk because I advocate the knife too freshly and I tell them, as I do you, that there is too large per cent of full blooded dairy stock that ought to be driven to the canning factory and embalmed. They then are scarcely fit for a good soldier to eat.

Let me tell you why I have become so intense, because that will help you to understand why I shall be so emphatic. I was one of the first, if not the first, winter dairyman in Minnesota. I came by my dairy inclination by heredity. I am a New England man, was born in the old Green Mountain State, Vermont. In the early 70's I went on the frontier to locate and make the home where I now live. It was a struggle for me to establish that home. I conceived the idea of dairying coming naturally from dairy ancestry, and I started out to improve my herd with full blood dairy sires, and for a period of twelve years I put hard earned money and credit, which I had afterwards to redeem, into four blooded sires, and every one of them was a failure. I never kept a single heifer from those bulls with which to improve the quality of my herd. Meamwhile I increased my herd by going out and buying cows and heifers. My Scotch-Irish blood became exceedingly hot and it has not cooled yet. I tell you frankly there are times when I think over this matter when I earnestly wish the laws of my church would allow me to say hard words. Twelve years of struggle, twelve years of failure!

How Failure Taught Me to Succeed.

Now I tell you what I got out of those twelve years—I obtained twelve years of experience, and twelve years of knowledge. Then I began to breed by selection as I now will talk to you about this morning. In so doing I have made a success. (I have a picture here of one of my sires, which I will show you after a while). I want you to come to believe as I do and I will tell you how we will have to begin. It was my great pleasure at one time to listen to old Bishop Taylor. You may have heard of him. He was the Bishop of Africa in the Methodist church, but before that time he had a national reputation as a street preacher in San Francisco and made a great success there. I cite these things to show you that he was a man of great common sense. A man that "bucked up against" the gold seekers in the streets of San Francisco in '49 had to know something. His speech was not an oratorical effort but I got one thing out of it that I shall never forget. He said, "If you ever wish to bring another to your way of thinking, always commence upon a common ground of agreement." You think that over and see how correct that is. Do not begin with disagreements, begin with some place somewhere where you can agree. That is what

I want to do this morning, particularly you who differ with me on some things that I know.

By the way, at one time, when speaking to an audience, I asked them to raise their hands, as I will ask you to do this morning, and one man in the audience said afterwards, "That man talked to us like we were a lot of Kindergarten children." I thought his criticism was not good and I shall ask of you the courtesy to raise your hands pretty soon.

Strong Likeness Should Exist Between Sire and Dam.

First many of us are well acquainted with the English running dog no matter where we see him. Now then, let us think of a pack of them, any number you may select, and we will bar two things, viz. color and the distinguishing features of sex. Now then I want you to answer this question, if you please, are they not all alike? both dogs and females? Aside from the difference in color and sex is there not a conformation so nearly alike that when you see them you say, "There is a running dog?" I note that you agree with me. That is good. No one disagrees.

I will go further, there is the English running horse, what we call thoroughbred. We will select a group of them, both stallions and mares, and barring in each case as before both color and sex, are they not all alike? All agree. All are alike, just as peas out of a pod.

Now I will take a herd of beef cattle. I do not care what breed they are, good beef stock such as you are familiar with. They have a square form, they have a good back and all good beef qualities. Think of them as a herd where there are bulls and cows; now, barring those two things, color and distinction of sex, are they not alike? Certainly.

I will go further. I will come to one place where that thing will not maintain, and that is where you come to the so-called dairy cattle. I can speak with authority. You may take all the cows that are great producers from any of the dairy breeds and you can score them by the same card; they have the same essential characteristics and conformations, but when you examine the bulls, you will find them in all forms and shapes. I want to say it impressively that many teachers in our agricultural schools do not believe this statement, that the dairy sire is as distinctive in his type as is the running dog, the running horse and the beef sire. Now we have a common point of agreement;

we agree on dogs, running horses and the beef cattle, and I expect that we will agree when we come to the dairy animal.

The Dairy World Needs Better Cows.

Now I want to speak briefly concerning a remark made here yesterday, which lays stress upon the food question as the all important question with you in this dairy district. I differ with this statement. It is not only the food, but it is the animal that you feed.

There is where you are weak. I have already seen this morning enough to satisfy me that you are feeding a lot of stuff here that I would not take upon my farm as a gracious gift, and yet I raise grain in abundance under circumstances that enable me there to do it, while you have to pay high prices for the same.

There is your weakness today in this dairy district. Your own teacher from the agricultural school has made that point very strong. Do you not remember what Professor Frazer said last year at Joliet concerning the great number of poor and unprofitable cows that he has found in your dairy district of Elgin? I am always glad to find a man like him who seeks after facts that are needed to be known in the work of dairying.

How are you going to fill the gaps that will be made when you reject the poor cows? You cannot buy the dairy cattle that you want—they are not being bred. I have traveled for twenty years, have had great facilities for traveling. I have visited a great many breeding farms. I was thoroughly interested in this breeding question, having suffered as I did, and having seen as I have men of bright ability tied down to a lot of cows that were not worthy of their feed and care. Prompted by such reasons I have visited breeders and as far as I could I would go without a card, but if necessary I would take my card and that would give me a good introduction, and then I would try to get their ideas about breeding, and afterwards I would submit the case which I will submit to you, as far as time will allow.

Good and Bad Breeders of Dairy Cattle.

I will divide the breeders in America into three classes. There is one class of conscientious breeders, men who know their business; they do not know everything, I do not know everything, but they are seeking to know. There is another class of

men who are absolutely ignorant; all they do is to buy an animal as a registered animal, breed him, report their increase and then sell them. Then there is another per cent. larger than I had expected to find, who are purely jockeys in the handling of pure bred cattle. They are unscrupulous men. They know the stuff they sell is not worth what they ask for it.

I had one man in the state of New York assume to object to that proposition, I replied that I could call the name of one of the breeders in his own state, i. e. New York, who was absolutely unscrupulous, and I added that I could prove it before any court in the United States. The party raised no further objections.

That is one of the propositions that you are up against gentlemen. I am a man of peace, I love right things and happy things and loving things, but some times it is a good thing to sow a seed of hatred; hate the devil and all his works, hate it with a perfect hatred, and sometimes it is hard to draw the line. I do positively hate poor dairy breeding, that is the way I feel about it, and I would just as soon you would receive some of that contagion as not.

Good and Bad Cows.

First, I am going to tell you why I say the important factor with you is better cows, not feed, and when I get through I want you to tell me whether I am right or not. I am going to select two cows, let them be before you in mind. You know there is only one way to feed. You may call that feed worth 50c or 60c a bushel, but you know that the two cows have different characteristics. With one cow the feed goes this way (referring to chart, e. e. to waste). You understand me? It goes out as manure. The kind of cow that I keep and know how to breed, after a struggle of thirty years, is the cow that throws the proper waste where it should go and throws the other amount here in the udder. I do not care if corn is 50c a bushel, she will pay for it if properly fed. In other words the good cow makes a good market for high priced feed. She will consume the roughage and separate it as it ought to be, and preserve and save all of the food as it should be saved and you will get good returns for all of it. You need not be scared by high feed. You do not think that 50c feed would scare me when I feed it to 400 lb. cows? They do not all give that amount but a cow has to give

350 lbs. of butter in one year or she can not stay on Coteau Farm. Do you agree with me in my hatred of those fellows that sell the other kind of stuff? I well remember when I said similar things when I commenced institute work over twenty years ago (and I did say some hard things). An agricultural editor who lived in the city said to me, "Mr. Gregg, if you do not stop this kind of business we will break your head." I said, "You start in and break as fast as you have a mind but if I have harder words to use then I am going to use them. What I have learned has not come by guess from behind the editor's desk but has come from hard knocks in connection with the cows."

My Starting Point in Understanding Dairy Cattle Improvement.

The greatest thinker of the 19th century was that man Darwin. I saw a short time ago the opinions of some of the leading intellectual men of the world, giving in their judgment the man who had done the most to start intellectual life in the world during the past generation, and every one of them headed the list with Darwin. I owe to him much that I have learned in the improvement of dairy cattle, I will tell you some of the principles that I obtained from him. Now I am going to discuss this with reference to the law of life and will submit it to you and as I go along I will dwell on it so you can feel the force of it.

Every form of life is continuously changing by reason of environment or surroundings.

Every form of life, vegetable and animal, is continually changing by that law of environment or surroundings. I wonder how many caught the truth in that statement? You are thinking men. I got that thought thoroughly in my mind as I read that man's book; then I began to observe. The best place in the world for a man to grow mentality is on the farm where he is not interfered with by many social duties, where he can take the literature of the day, read it and think of the world about him, observe and think, and the joy of it is better than the joy of getting drunk! So I began to think, observe and see.

Now I Will Give a List of Some of the Things.

Everything responds to that law. When I was a boy and lived in old New England I used to go out and help get liberty poles, i. e. flagstaffs. Where do you suppose that we found a

liberty pole? We either found it in a deep valley where the hills on either side compelled that little tree to shoot up and up until it crowded its head up to the sun, or we found it where it struggled with tall trees and still had enough sun to live, and fight sun. The Anglo-Saxon has not been burned enough so as to Take the trees on the prairie, how do they grow? By the same law they have to spread out and stay themselves to resist the blast, and sometimes they will vary according to the prevailing winds; that illustrates the law of environment. Race prejudice is based on what? A black man is the son of the torrid zone, he has a skin that will resist heat and some make it alone a social barrier. I have been South and I have come to respect the southern man because I know how he is situated. I know his prejudices and know what they mean in the human mind, and I also know that there is in the South something more than color which enters into the race question there, but when you go back of it all it is a testimony of environment. In Minnesota we have a great many Scandinavians and I sometimes tell them, "Your flaxen hair is the testimony of the northern rays of the and shoot itself up. That illustrated the law of environment. get rid of the fair skin."

I felt the force of this law until I got thoroughly imbued with the idea. I rarely looked upon anything without saying, "what caused that?" and I want to tell you what a happy day it was when I first discovered this in relation to dairy cattle. In the early morning I took my lantern, hung it up in a section where I had my ten cows (each man had ten cows to milk). I took great care of my cows and they were comfortable. I was milking and while I was milking that thought came to me—"what is the law of environment that has made the dairy cow as she is?" I said, "I have got it. I have it; we draw all the milk from the udder that we can, then we call on Nature for more milk,: which Nature provides to sustain her young." The milkman is a second-hand calf!

Now follow me and see how clear it is. There is no force in Nature so strong as this great procreative force. Nature said, "Here, that youngster down there is lacking food, we must have more food, more milk." We must have more blood, we must have more feed, and a bigger place for the feed. There you have it. Here is the law of development. It starts here

from the udder (Illustrates by chart) and goes at once to mouth for feed, to body for a great digestive tract and thence to the enlarged udder. Yet some men lay more stress on the color of the hide than upon all this. One will want a black and white, one a white belt around a cow. What does that amount to? Nothing counts but that one thing that the animal eats an abundance of food, digests and it assimilates and makes an abundance of milk. You can get that type among all breed and then again you get a lot that have no type, and then what? You have nothing.

I tell you it makes me ashamed to think that we are in a land where we have high schools, colleges and universities and yet upon our farms there are many men that do not understand the animal that sustains them and their homes. There is a whole lot of learned men in this world that are graduates and do not know what to do with themselves, and no one knows what to do with them. Put a so-called educated man beside a cow that he does not understand and how much will his Greek and Latin help him out? Poor fellow! His study may have stimulated him to think. In that case he will get good.

America's Mission Is a Peaceful One.

I am going to diverge a little here and give to you a burning thought which is in my mind. America has a special mission, her mission is to develop the arts of peace. The old country has given us enough of the arts of war. They have piled up national debts to the extent that they never expect to pay them. England never expects to pay her national debt. Then look at the multitudes of orphans and widows and the anguish traceable to a battle. Do you know that one of the artists in Russia was suppressed because he was so realistic in his painting of the agony of the battlefield that the Czar would not allow him to exhibit his paintings? If the paintings were awful what must be the actual battlefield? See the folly of it, killing each other to settle questions. America has this mission and I believe that she will succeed as she cultivates to the greatest extent the arts of peace, makes homes and makes them happy, makes them clean and makes them white. That is the kind of American home that I love and anything contrary to it I hate.

Nature Adapts Form to Purpose.

Now then, I have given you considerable general thought concerning the development of dairy cattle and for a little while I am going to make plain how it is that this body changes in response to the law of environment. Nature has a law like this, she always adapts a form to a purpose. It is remarkable. Why this world is full of illustrations. Take a hen's foot; she does not swim, does she? She is in an awful pickle when you throw her into the water. A duck's foot is different, is it not? Take the giraffe with his long neck, he lives on trees and the little fellows could not get anything in times of famine and died, so the long necks survived and the long neck is the characteristic of the giraffe. And so it goes all the way through, Nature is continually responding to the law of environment.

Now I will tell you one thing that was brought out by Professor Nachtrieb of the University of Minnesota, that illustrates very strongly this law of change as shown in the bony system of the well bred dairy animal. I happen to have a good picture of a good Jersey cow here and I am going to put my hand on the picture as I would on the animal herself. Here I will find the floating rib and in every case, regardless of breed and everything else, if the animal is strongly dairy bred I am going to find a wide space between this hook point and the floating rib. I observed that for a number of years and finally I went to Professor Nachtrieb, who stands among the best as an instructor in biology, and I said, "Professor, what does that mean?" I had also a number of other questions. He said, "Oh, Mr. Gregg, I do not know anything about cows." "But," I said, "you are a biologist and you can probably tell me why this wide space exists," and he replied, "In the early stages ribs were made to protect the vital organs, the heart and lungs, but as the years have passed by the ribs have assumed another function. They are used to help in breathing. We inhale the air, then expel it and it is expelled in the part by the collapsing of the ribs."

While he was talking I was thinking about my cows and pretty soon I said, "Professor, I have it. This cow of mine has to eat a whole lot of food in order to keep up the blood supply and the consequent milk supply. That is plain. And as a consequence she has to have a big paunch or first stomach and these ribs can no longer act the part of bellows, and what does Nature

do? She eliminates them, puts them out, and a floating rib is nothing or less than a rib in the process of being rejected because it is useless." He said, "Mr. Gregg, you may state that before the best authorities and they will never dare question you."

Why We Observe Rib Spacing in Judging Blooded Dairy Cattle.

Let me stand side by side with a dairy sire and I put my hand on him and I note that he is wide spaced, and I know he got that from dairy ancestry. Here is another one that is close ribbed. What have I in him? I have a fellow that has inherited some things that I do not want; his ancestors did not eat largely and if they did not they could not produce largely. Now how long is it going to take me to go over to the first sire and say, "Here I will look at you a little further." Notwithstanding I have seen full blooded sires in the rings that received blue ribbons that were as close ribbed as beef sire should be. I have studied the score cards of Jersey and for generations they have been putting a blue ribbon on a close ribbed bull. That change of course comes after generations of dairy breeding. When I was in Chicago a few years ago at one of the great fat stock shows I met a prominent breeder of beef cattle, a man whose name I cannot recall. He wanted me to look at his cattle. I was talking about some of these things to which I now refer. I put my hand on them. They were fine and I noticed that they were wide spaced between hook point and floating rib which surprised me a little. The man said, "We started in with stock that were spaced and we could never restore the bone again but we have filled up the space mighty well with flesh, have we not?" I want you to keep that statement well in your minds. "Gentlemen, I am willing to submit to you that when Nature has made a mark like that that it is wise to take that testimony in place of any book, whether it be a book of registry or anything else." Some call that view of the case a heresy, but I say it is a truth.

The Horn Will Show the Signs of Dairy Breeding.

I will give you another point in the bony structures. I talk about these parts because they are the results of generations of breeding along the line that I want to go. On this chart is a picture of a great dairy sire. It is an excellent outline that was drawn by one of my former associates, who was remarkable as an animal artist. This outline was produced from a lifelike

photograph of old Mercury, one of the grandest dairy sires that America ever knew. Note his horn, it is fine at the base, why? I will tell you why. A dairy cow is a high development of a *maternal* of the cattle race. Darwin brought to light a great law of Nature when he used the term, "the survival of the fittest." The survival of the fittest nature is the survival of the strongest and that test is always established by the law of battle. That is why the Buffalo bulls on the prairie would fight and struggle; we found ground during our frontier life and experience where the sod was broken by their contests. The strongest survived and became the sire of the succeeding herd. That is a characteristic of the whole animal race, it holds true in reference to a herd of dairy cattle. As a consequence of that law of battle you observe how our cattle fight, it is a part of their heredity. If you have a necessity to tackle a bull never approach him in front, he is ready for that place of attack. Take him at the rear, he does not know how to meet you there. In his neck is his tower of strength, a heavy neck, a heavy shoulder and a heavy horn. These are three towers of strength. A buffalo is particularly strong at those three points. The same is true of our Herefords, see the horns, crests, and shoulders which they have. In the well bred shorthorn of today, that has some superior dairy blood in his ancestry, you will often find a good horn, often with a thin shoulder. We will observe this law a sire appears in fine dairy breeding. Nature says this dairy animal is a great mother, the mother does not fight. She will be fought for, and in response to that law nature will begin to reduce the towers of strength. That is where we get the crumpled horn which we sing and talk about, and the thin shoulder. Now understand in the sire with a thin neck, horn and thin shoulders you have nature's testimony that that sire is backed by a line of dairy ancestors. The dairy sire is the son of his mother.

Important to Select by Form, as a Check on the Dangers from Reversion.

Important to select by form, as a check on the dangers from reversion.

I have now given you two law points in law of battle as affecting dairy breeding and now just for one moment, I want to tell you the absolute necessity of our observing them, and I can tell it best by telling a story. Old General Sherman one day was talking about himself and comparing himself with General

Grant. You know he was a loyal man to his superior officer Gen. Grant. There was a group of officers around him and he was talking about Grant. He said, "I am as well educated as Grant is, I can handle a division of men as well as Grant," and he spoke of other things that he could do as well as Gen. Grant, but he said, "Gentlemen, there is one thing in which Gen. Grant exceeds me and any other man that I ever knew, he did not care a d—n what the enemy is doing that he can not see, but that is what scares me like the devil." Now let us apply that to breeding. Here are the animals that I can see and they do not scare me but it is the animals behind me that I cannot see that scares me. They influence the progeny by reversion. There is many a breeder behind us that you and I do not want to copy. When I find an animal so individually strong in his body, as this fellow Mercury is, I have the testimony right in his very bones and all parts of his body which tell me that I am shut off very largely from those ancestors which I cannot see and fear. When you go among cattle remember what I have told you. You will find dairy sires with horns on them like a buffalo and a shoulder like an ox. Some men may want you to buy them on the strength of paper but I will first select my sires according to their confirmation and then I will book up the registry of their performing ancestry.

Needful to Have Large Mouths and Wide Bodies.

I have said enough for the time allotted to me on the bony system. I am now going to take up some other things that appear outside of that system. In the first place you have to have your cows and consequently you must have it in your sire, that we all a big wide muzzle and roomy body. I ought not to say anything more about that for how can it be otherwise when you have a great storage capacity as provided for in the first stomach. This class of annimals first swallow before eating. Cows do not eat at first, they fill up, and the chewing the cud is eating. They must have much storage room. When the food has been chewed, then returned to the second stomach and further digested, then it must be taken into the blood; this demands a long digestive coil, a long intestine. How can you enclose the great first stomach and that long digestive tract unless you have a capacious body? That is simple enough and yet you will find some of those bulls with long pedigrees but with

little narrow bodies. How can he transmit body capacity when he has got it himself? Carnige bestows libraries but suppose I should promise a library for Marengo, you would want to know the size of my bank account, would you not? The types of sires that I have seen at the head of some full blood herds is enough to put men on their guard in the purchasing of dairy bulls.

Where Some Badly Bred Bulls Come From.

I was in Boston attending the Bay State Fair nearly twenty years ago. In the basement of that building was the gathering of some of the best dairy cattle of New England and the Middle states. I met there the son of a very wealthy man who had graduated from one of the eastern colleges and had taken a liking to stock. He was a good stock judge and he said, "I wish you would come and see our place." So I went and saw his cattle and he said, "Come and see some of the neighboring farms." It was in the suburbs of Boston and he took me to one farm where a wealthy man was carting soil upon the rocks in order to increase his fields. We went into the barn; it was finished in hardwood and oil and numerous men even employed to take care of the cows that were so elaborately stabled. I learned that this young man had selected these cows himself on the Island of Jersey. I said, "I want to see the sire at the head of this herd." So we went out to the ben and looked at the sire. I did not say a word until we had returned to the barn and then I said, "It would be an aid and help to the owner of this herd to kill that bull, cut him up and feed him to the chickens." He said, "I know he is no good but these rich fellows who employ me pay me well to go across the water and buy full blooded cows, and I generally try to select a good bull. They will however have a dinner and talk breeding. Now those silk stocking yankees don't know anything about the selection of cattle although they have inherited love for the field and they become enthusiastic over a certain family and nothing will do but they must have a sire from that family. So they buy him and get themselves finally into the ditch and then have to come and pull them out." Then I was hot as I could be because I called to myself when I was struggling to build up a farm out on the frontier I was struck in the neck by such fellows with lots of money and no sense.

Even the Mouth May Show Dairy Excellence.

Ever keep in mind that every dairy sire of quality regardless of his breed will have a conformation just as distinct as a Nod I will make another. He will have a mouth on him like a paunched gopher, a great big mouth. One of our professors at the State University said to me, "Mr. Gregg, your law is right, different forms of life live on different kinds of food." Where animals including the lesser form of animal life, such as insects, eat the more bulky foods, they have larger digestive tracts, and also by the law of corrolated parts, they will have larger mouths. The strangest thing to me is that sometimes men will disregard such evidence as this and say the thing is a kind of "fad" when it is as true as "two and two make four." I owned at one time one of those pinched mouthed fellows and the best experience that I ever had with him was when we dragged him out of the stable a dead animal and sold him to a country butcher. He made poor beef and I let the other fellow eat it.

The Eye Is an Important Feature to Be Noted.

Here is another indication of a strong dairy breeding, viz: a large full eye—one of the most important factors in the whole list of evidences. Now just see if I can make it plain and if I do not I want you to tell me where I am wrong. I lift that stick by muscular effort, but when I am talking and thinking as I am now I am not drawing on my muscular system. After a time I must go out and take a walk to get the exercise I need for my muscles. I am not drawing on my nervous system, and I will feel weary from this effort of speaking when I am through. Students know what that is. Digestion is carried on by the involuntary action of the nerve system; when I talk I call upon my will so talking is a voluntary act, but it is an involuntary action which carries on indigestion. Some of you men have reached that stage when after you have become exceedingly wearied with mental or physical labor you do not want to eat much. You know you have a horse that has been overworked you do not want to feed him heavily else you will have a case of indigestion. One of the great taxes on the nervous system is the tax of milk secretion and if I am calling on an animal to give me a large amount of milk I must have an animal that has the reserve force of a great nerve system to drive th emachinery. You could not get me into a wrestling bout; I am considered a

strong man at 63 but I have not muscle enough to go on the mat but my nerve is good. The cow must have a strong nerve system and the best evidence of its presence is a large full eye. It is an outward sign of inward grace. Observe carefully and you will find a whole lot of dairy sires with small eyes. He might have a large digestive tract but if he lacks power to drive it, he is like a great separator with a ten-horse engine as a source of power.

Handle Dairy Bred Bulls With Great Care.

Let me offer a word in caution. In proportion as you get a high development of the dairy sire you have a dangerous animal unless you treat him rightly. If you confine him he gets restless. He is full of nervous energy and when you let him out he will want to play. If you snap him up with a leading strap or staff the game is up. As soon as he learns that he can overcome by that law of battle he is a dangerous beast. It can be checked by giving him a tread power, and I would have a yard and stable so fixed that if he is you can handle him without being exposed to danger. We all have known of people who have suffered injury and death from those infuriated beasts.

Evil Effects Which Follow the Work of Bad Breeders.

Now if you have any questions I will answer them, then I will take up another proposition. Do you understand me so far? I am glad to note that you do. I remember a meeting in a certain state the name of which I do not wish to call. I was attending a breeders association where they did not breed along this line, and this sort of an address did not make a soothing effect, but they did not say anything adversely. They knew that I was right, but it hit them pretty hard because they had a lot of stuff to unload. Oh, it is too bad, and think, gentlemen, what it means. Let a man play poker and lose his money, and he will feel badly and get over it quickly, but when he puts his money into a sire with expectations, waits three years and finds he has nothing, it is a serious matter. There are three years of time, three years of food and three years of opportunity turned into disappointment. It is a very serious matter.

There is a law of proportion in communities. There is a certain percentage of men that are progressive, you generally find them at meetings of this kind, men who want to go ahead,

intelligent public spirited men, they are the ones who generally get hurt in matters of this kind. The betterment of the stock interests is badly hurt when one strikes men like that. They represent better things and when they have their disappointments and lose their faith then progress in that community has lost a leader along the line those men represent. I would not want to be guilty of that kind of thing. I have thought the thing over and I can not see any remedy for this except that you and I, as men who propose to get our revenue from dairy stock, study stock more and become judges ourselves, or in some cases you might have some body who does know and let them search out and obtain for you that which you want. Life is too short to buy an animal simply because he has a pedigree. I tell you frankly it is a losing game.

Sometimes people have gone away from a talk of this kind and they say, "That man Gregg does not believe in full bloods." That is not true. I do believe in full bloods but I also believe in selections from full bloods. Is there any heresy in that? If there is, make the most of it. The trouble is among full blood stock that there are saints and sinners and the only way I know of is to sort out the good. Guard yourselves carefully. Sometimes if the sinner is plump and nice and has a blue ribbon given him by some ignorant judge, there will be an extra price put on him.

The Case of Heredity.

Now let me see if I can give you the law of heredity. Sometimes I have heard men talk about breeding and they say it is so unfathomable that you cannot understand it. There are many things that we cannot understand, but that is not saying but that there are some things that we can understand. You and I know that "two and two are four." Some man is measuring the distance to the sun and he also says that "two and two make four." There are some things that we understand and some things that we ought to understand, and can understand, and here is one thing that we can understand and that is the law of the value of the full blood. I will illustrate it this way: Here is an animal right here that I want. He is a full blood. He has a dam, he has a sire and from those two ancestors begin to multiply rapidly. Now as I stand by the animal selected I will give a brief definition of breeding as it is sometimes stated: Breeding

they say is "like begetting like," now this sire suits me finely and they say that he will beget like. No not always. That definition of breeding is but half of the truth and half a truth is as bad as a lie. The whole truth is that in breeding "like begets like or the likeness of some ancestor." That is where the trouble comes in. Reversion comes in with all stock, and you can now see why I lay so much stress on these things which are so essential to right breeding.

We cannot at this time expect to get everything, but I want to get from that sire pretty near what I find in him and added to that to be aided by those dams of great performance and helped also by his sires that have been properly bred. I am willing now to take the law of breeding as I have given it; if he begets like himself it is all right and if he goes back to his ancestors by reversion it is still all right. I have had men send me a paper pedigree and wanted to know what I thought about the animal. A paper pedigree only will help a man to guess.

A few years ago I started out of the postoffice in Minneapolis. It is rather unusual for a man to holler across the street in the city, but somebody cried out, "Hello, O. C., how are you?" I recognized the voice and it was one of my old friends so I went across the way. "Well," he said, "O. C., I thought I knew you, I knew your gait." I have been walking for sixty years and I suppose I have walked so long in one way that I have a gait that belongs to O. C., that fixedness of gait has come by repetition. If I had a blackboard here while I am talking I would write my name and you could hand it to a certain cashier in Minneapolis and the cashier would say, "That is Gregg's signature.' I have repeated it and repeated it until it is always the same. The same law applies to breeding. We have been repeating, repeating, repeating the good qualities until we get them here on both sides and behind us which is so important. Now by the law of repetition of a chosen type I have the power to transmit the things that I want.

The Weakness in Breeding from a Grade Bull.

When you talk about a grade bull you have to cut off one-half of that power and by reversion you are liable to go back to what you don't want, and the danger is strong because the tendency on the part of the animal life and all kind of life is to revert to the original type. The dairy animal is an artificial

condition, nature will struggle to regain the original type. For nature is jealous of strength and vitality. The God of all wisdom proposed to have life protected by vitality. We have made for ourselves the dairy animal by increasing blood and changing the circulation of blood from vitality to milk giving. If we stop feeding, caring for and breeding her carefully she will revert and so save vitality. I knew the value of full bloods but I want them of the right kind. It is a good deal like church people, they aggregate the best people in the world, but if you trust every church member you meet you will get woefully left.. You should not expect anything better. When the Great Teacher, that Wonderful Teacher gathered the twelve He received a thief. I do not wonder that the preachers now and then get some stuff in their net that they wish they did not have. When I say that I do not underestimate the fact that the strength of every state of society rests very largely with the churches.

How "Redemption" Was Selected.

I think under existing circumstances I have held your attention long enough and will do as much good as any other way if I tell you how I came to select that successful Jersey sire. That is a very good and lifelike picture of the sire at my place. He is about twelve years of age. I selected him when he was a calf, a little fellow. He is known as "Coteau Farm Redemption." I had such an absolute confidence in the qualities of that animal and the power that he possessed to transmit what I wanted, that I had him registered as a calf as "Redemption." Here is the history of his selection. I was in Wisconsin attending a dairy association. After the convention was over a young man came to me and said, "Mr. Gregg, I wish you would go down and look over my herd." I had been talking cattle there. I said, "I will stop off on my way home." I went to his barn and spent some time in looking over his cattle. He was one of those men that I could talk to very freely; there are some men so constituted that I never tell them what I think about their sires, they will not take it. To this man I could talk plainly, so we went over his animals, his bulls and his cows, we discussed them and I found some very good qualities there, and as I was going out the barn I looked back to get the last glance of the herd and right off in the corner was a bunch of about five calves in little stalls. I noticed that just one of them had stepped back

from his manger and was eating up the straw of his bedding. That was all that attracted my attention. I said to myself, "Well, that little hungry youngster has eaten up all the hay they gave him and now he has to fill up his paunch with straw. I must go back and look at him." So I went back, unhitched him and pulled him out on the floor, and I will tell you what I did then. I noticed even then as a calf that he was deep and capacious body even this picture does not give the extent that he has developed in his middle piece. The next thing I put my hand right here (illustrating on picture by placing hand on the lower rear part of the body) this is a very important thing; I found that the skin over that part of the body was just as soft as silk; it was very loose there, as I pulled down the skin with my hand it came down easily and loosely. What did that tell me? Why I said, "Back of him is a great line of cows with udders so large that when they dropped a male they dropped him with the looseness of skin that had covered that part of the body of his ancestors." Then I noted that the hair was fine, just like silk. This also is very important. What does it mean? It means that the blood of his ancestors had flowed there so long and abundantly and had created so much of animal heat that Nature had thrown off the covering of hair as we throw off our overcoats when it is warm. Some of the cows have a hairless udder.

Another thing, I put my hand on the lower part of the body and I found in that little calf, not quite six months old, well-holes, as we call them, almost as big as a lead pencil. Actually that little fellow had a well-hole on each side as big as some cows." If I had time I would dwell upon this thing, viz: the law of the milk vein. At one time I was on a farm and had a conversation with a breeder of full blooded stock, and he actually thought that this vein took the milk from this body and run it down into the udder like a cistern. Think of such dense ignorance as that. Why is it that you will find dairy cattle without the milk vein outside the abdominal wall and you will not find it so perceptible among beef cattle? You can tell it yourselves it is to escape the pressure of this great paunch so as not to retard the flow of blood back to the heart and lungs. I said to myself, "I believe that little fellow will develop two on each side and he will then have two more than half of the cows

have." You will not find two holes on each side on half of the cows. Note the philosophy of it. Wet I have read in dairy papers that the milk vein and the milk wells did not mean anything in the selection of cattle! I know that I am right. If I had time I could multiply experiences. In proportion as that vein is extended you will find the testimony that the animal has been line dairy bred. You show me a native cow and if she is a great milker I will say the veins are about here (illustrating on chart about the middle part of the body). Now when cattle have been bred in dairy lines then the veins are extended so as to avoid the pressure of the viscera as much as possible.

Of course I looked up the ancestry of that calf and I said, "Young man, do you want to sell that fellow?"—"Yes"—"What do you want for him?" He gave the price and I said, "I will take him." That sire has been largely used on grades. I had Jerseys, Holsteins, Guernseys and Shorthorns and Red Polls in grade from all good milking cows, and he was used as a sire, and out of that selection I have obtained, as I told you, some cows that make 400 lbs. of butter a year, others 350 lbs. I had one cow that reverted, she was a Shorthorn milker, the beef blood had got the better of her, and I threw her out and all her progeny. So you understand that do the best you can, the evil that is behind you now and then will hold you back. She was a milking Shorthorn, a grade.

Home Coming With "Redemption."

Wasn't I happy when I got that calf and brought him home? I said to my wife, "Lottie, see the bull that I have brought home." Mrs. Gregg has not the love for cattle that I have but she is a grand woman and she said, "Orin, he is awfully homely," (and he was homely enough to break a pane of glass) "what are you going to do with him?" "I am going to keep him, Lottie, have him registered, and I am going to have him registered "Coteau Farm Redemption." "Oh," said Lottie "Don't you do that it is sacreligious," and I said, "I do not mean to be sacrilegious, but that word means something, it means that this little fellow is going to redeem Coteau Farm from poor cows," and he has done it.

I wish that every man in the dairy business could get a sire something like that. I know what it means to raise dairy cattle;

You cannot afford to raise a calf unless he is of high quality, and you cannot get high quality unless you have the sire. I have seen sires that you would not think of taking the risk of raising stock from.

A Plan for Raising Better Cows.

Now I have a plan to suggest to you farmers. I hope that I have made some impression on your minds, I have come here for no other purpose. Now my suggestion is this, I would get you to band together and get a few sires. Do not make a mistake in doing it. I assume most of you are individual farmers and I would not for all I am worth enter into a contract to furnish you all with such a sire as I am talking about, because I could not get them, but there are some that can be had without extravagant expense, and I would have them. I would have them and have one serve each neighborhood. Get a few like them and you will settle this whole thing.

Marengo a Good Dairy Market.

I thought this morning when I was walking the streets of Marengo that I wished I could be near this place. for if I could get $1.60 a hundred for my milk I would certainly be on "Easy Street." I would not milk cows without a middle piece, or cows with an udder like a goat and horns on them like a buffalo. Think of what a cow does that gives 10,000 lbs. of milk a year. I get an inspiration when I go among them, my cows but back of this success lies the failures of my early struggles. One of the greatest joys that ever comes to the heart of man is the joy of conquest. My ancestors were Scotch-Irish, so I inherited my fighting blood and I tell you every man with manhood likes the law of battle, but I prefer to turn it against the obstacles in my way that stand between me and my home, and fight it out and win. I thank you.

The President:—I want to refer to the matter of membership and I have appointed a number of men who I hope will urge you to become members, as we need your moral support as well as your financial aid. I will add one or two more names to the membership committee and as I call those names I wish the gentlemen would step out and get membership cards and

then they can scatter through the audience and take your dollars. This committee will consist of

Messrs. C. J. Gilkerson, Marengo.
M. S. Campbell, Genoa.
John Newman, Elgin.
Andrew Fredericks, Elgin.
Mr. Coulter, Marengo.
O. V. Fox, Chicago.
E. Sudendorf, Clinton.
F. Michener, Chicago.
Harry Hayes, Chicago.

I want to again call your attention to the banquet tonight. The ladies have taken a great deal of trouble to make this a nice affair and I hope you will assist them by your presence. This afternoon I will appoint one or two other committees. Immediately after this meeting I would like to get the resolution committee together. I will appoint on that committee: Messrs. John Newman, Elgin; M. S. Campbell, Genoa; M. Long, Woodstock.

President Wiggins not being present the first day did not read his address but it is here presented and tells of the Association's work for the year as follows:

PRESIDENT'S ADDRESS.

Ladies and Gentlemen:—

Naturally you are expecting me to deliver an address, but you will have to be satisfied, at this time, with a brief report of what your officers of this Association have been doing in the past year.

We were delighted to accept the kind invitation from the citizens of Marengo to hold our annual meeting in their city. Every inducement was offered us and the Citizens' Committee have been most energetic and liberal in their preparations. And in behalf of the Dairymen's Association I wish to thank the citizens of Marengo most heartily for their hospitality and sincerely hope that the results of the meeting here will be profitable to them financially, as well as mentally. The eminent men, who

will address the audiences at our meetings, I am sure will arouse enthusiasm and help us all to get a better understanding of the dairy business.

It is highly important that we dairymen begin to systematize our dairy business. I am satisfied there are too many men throughout this and neighboring states, who are milking cows, day after day, struggling along from morning until night trying to make a living, or a satisfactory profit from these same cows, without a scratch of the pen toward keeping records of the results of the returns and the expense of keeping up their herds. As you have heard me say before, it is highly important that we consider our cows as individual machines, alive machines, with individuality, which it is necessary to study carefully each day. We would not think of entering upon any mercantile business without some system of bookkeeping. If we were going into a factory, where we were obliged to operate a number of pieces of machinery, we would have to know positively the results and capacity of each individual machine, and we would keep track of these results in some set form of bookkeeping. How many farmers know, accurately, how much feed their cows consume in a year and what it costs per head to feed these same cows? I feel safe in saying that there are too many dairymen, who feel that the expense and trouble necessarily undertaken in keeping individual records of their cows, will not pay. Let me say, positively, that it does pay; and if you do not think I am right, try it, yourself. If you do not want to try it, try and get your boy interested in your cows, so that he will begin to keep records of the cost of feed and the results at the milk pail.

At our meeting, last year in Joliet, we decided to undertake quite a number of new features, viz: in the operation of a dairy train, through the northern part of Illinois; the acquiring of a larger appropriation for this Association from the Legislature and the holding of a meeting at the State Fair. I am happy to say that we have been successful in these three main undertakings. In March of last year, we operated a dairy train over the Sante Fe System and within six days talked to many thousands of people. We are constantly hearing of good results from that train. The Sante Fe people are more than pleased and I am of the opinion that when the railroads begin to appreciate the vast results that they can accomplish by the operation of these

trains, with the co-operation of this Association, they will come to us and ask us to assist them. Your President had the privilege of traveling with a dairy train operated by the Experiment Station of Purdue University of Indiana and the Monon railroad. I was very much pleased with the interest displayed throughout the entire route. The State Dairymen's Association, of Indiana, assisted in the promotion of this dairy special, and its officers are very well pleased with the results. I am confident that we can come in touch with more people, who are anxious for dairy learning, through the operation of these trains than by any other system, which we might adopt, of spreading dairy information and encouragement.

Your Appropriation Committee were successful in obtaining an increase of $1,000.00 per year over the old appropriation of $1,500.00. The members of the Legislature were very much interested when this Committee appeared before their Finance Committees and we were asked innumerable questions about dairying and dairy interests in this state. A great many Associations were unable to secure their usual appropriations, but your Committee, at no time, felt any uneasiness about securing the increase they asked for. I do not wish to say that it was an easy thing to secure this increase, but I wish to emphasize the fact that in our Legislature, we have a great many intelligent men, who are deeply interested in dairy farming. They see the commercial side of this branch of farming and are particularly impressed with the idea that the dairy cow is not a robber of the soil, and that the farms, which they own or are interested in will be held at a high state of fertility if they will allow the dairy cow to mill the crops of their farms.

At our State Fair, last fall, we were especially fortunate in having the hearty co-operation of Mr. Auten, Supt. of the Dairy Division. The entire State Board of Agriculture seemed to be impressed with the importance of having the State Dairymen's Association hold an informal meeting during the State Fair. Mr. Auten secured for us a large audience tent and erected a permanent platform. We were treated with every courtesy and furnished with every convenience, and I am satisfied that this Association gained many friends through this State Fair meeting. I hope you will instruct your officers, for the coming year, to keep up these State Fair meetings, and I am satisfied

that each year they will grow and become very popular and thereby of vast benefit to the dairy interests.

I wish, particularly, to speak of the good results achieved by the display of milk and cream at our State Fair; and I earnestly hope that all bottlers of milk and cream will remember the next State Fair and have samples of their product on exhibition.

In speaking of Fairs, it is highly proper at this time, it seems to me, to urge every dairyman in this state to boost the next National Dairy Show and interest his neighbors in the outcome of these fairs, as an educational feature.

Our State Pure Food Commission have accomplished a great deal within the last year. While this Commission did not secure the hearty support of the Legislature in its proposed new bill for proper dairy legislation, the Commissioners were, in the main, satisfied with the results. The Dairy commissioner has done wonders in the past twelve months, in the organization of his department. He is to be particularly congratulated upon his success in the prosecution of the Oleomargarine cases. The law regulating the sale and analysis of commercial food stuffs for live-stock is not properly constructed, so as to warrant a very active enforcement. I hope that this department will secure the passage of a much more effective law at the next session of the Legislature. However, a great deal of work has been carried out in regard to the concentrated feeds, the manufacturers and dealers have come to a better understanding of what is required and wanted of them. It is the duty of every man, who buys these feeds to see that they are properly stamped, so as to comply with the present law and to assist in bringing up the standard of all concentrated feeds. The price for these feeds is so high that one must be sure that he is getting as much digestible protein as he can for the money and he must know that he is not feeding some worthless trash to his cattle.

At the University of Illinois, last winter, the short course in Dairy farming was largely attended. Twenty-odd students passed the examinations in milk testing and your officers have heard very satisfactorily from a great many of these young men. I am satisfied that the attendance at the Short Course this winter will be greatly increased and that it will not be long until these young men can assist us materially in forming and operating Test Associations. It is the duty of every dairy farmer to try

to give his sons as much expert dairy knowledge, through the Experiment Station courses, as it is possible. This is certainly a day and age of specialization and we cannot afford to overlook the fact that the successful men in the dairy business are the men who have had some special University education in the dairy industry.

I feel that we are sadly deficient in this state in the production of dairy heifers from pure bred sires. I know it is a great temptation for a dairyman to buy his cows, fatten them and turn them off to the butcher. He probably feels that he cannot afford to raise the heifers, but year by year the supply of profitable dairy cows is decreasing and if we can use more pure bred sires and save the heifer calves, the dairy farmers will add to their bank accounts.

In behalf of the members and officers of this Association, I wish to extend a hearty welcome to the Buttermakers' Association. We Dairy and Buttermakers are all one and our Associations should act as a unit. In unity there is always strength, our interests are one and we all have to depend upon the good old dairy cow, the foster mother of the world.

At this time, I wish to speak of the earnest effort of your Secretary. He has been untiring in his devotion to the Association and its interests. He has brought it in close touch with the public and, I, personally, wish to thank him for his hearty support. I also wish to thank the Directors of this Association, who have in the past year been very active and willing to give much time and energy towards the promotion of the interests of this Association.

Wednesday Afternoon Session.

Meeting called to order at 1:30 P. M. by President Wiggins.

The Chairman:—As you will see from your programs, we have an interesting program this afternoon. We will first hear from Professor Hayden, of the University of Illinois. As you know, Professor Hayden is engaged in work at the experiment station there and lives with the cows. We will take great pleasure in hearing from him this afternoon. Professor Hayden will you please open the program? If you have any questions to ask while Professor Hayden is reading his paper, please put them

down on a piece of paper and after he is through ask him those questions and in that way start some discussion.

A FEEDING DEMONSTRATION.

Professor C. C. Hayden, University of Illinois.

Mr. Chairman, Ladies and Gentlemen:—

I have been asked to give you an account of the experiment conducted at Marengo last winter at Mr. Gilkerson's place and I have put this in writing so I can get it before you in a slightly more concise form, and if you want to get all the details you will have to follow me pretty closely because I do not expect to do much repeating.

I thought I would at the same time give you results of an experiment carried on at the station, so you can get the benefit of both of them. This forenoon we heard an excellent talk on cows from a man whom we all respect, whose reputation we are free to allow, and if you remember he told you the cow was the main factor, that it was not a question of feeding but a question of cows. Much as I respect his opinion and as much as you respect his opinion you will have to admit there is a great deal in feeding as well as in cows because if you have a flour mill out there and take there a wagon load of rye, you are not going to get good wheat flour, and if you do not bring anything to grind you will not get anything. Just the same with the cow, you give a cow a poor product and you get a poor product; if you do not give her anything you are not going to get anything.

I have been asked to talk to you about a little feeding demonstration carried on at Marengo by the Experiment station.

There is a tendency on the part of a good many dairymen to discredit the work done at the experiment station. They say that it is not done under normal conditions: and that the methods recommended are not practical. Most people prefer to be shown that a thing is true rather than to hear about it. A demonstration goes farther than advice. Though the dairymen of Illinois have read and heard a great deal from the dairy papers and the experiment stations, many of them still persist in feeding their cows very poor rations. Here is a ration fed by one Illinois

dairyman: four ears of corn and corn stover. Large quantities of timothy hay are still fed though some of our best investigators tell us that it has little or no value as a food for cattle.

With such thoughts as these in mind the following demonstration was planned. The object in this case was to show the greater value of alfalfa hay compared with timothy hay. We have advocated the raising of legume crops for roughage and a supply of protein, but it is difficult to get farmers to take this advice seriously. They are feeding cows to raise crops rather than raising crops to feed cows.

For this demonstration a herd situated in the dairy district was chosen. It consisted of 20 cows, eighteen of which were in milk during the demonstration. They were kept on the farm and cared for by the owner, (Charles Gilkerson, Marengo, Ill.)

These cows were divided into two lots of nine each, one lot standing on either side of the barn. No attempt was made to divide them equally regarding milk flow or period of lactation. The majority of those in lot I had calved recently or calved during the early part of the test. The majority of those in lot II had been in milk longer (See page 84). Lot I gave more milk than lot II. The object was not to compare the two lots directly, but to compare the two feeding periods in the same lot, using one lot as a check against the other.

It will be noted, as stated above, that some cows did not calve until after the feeding began. It will also be noted that the columns in the table showing their production have been filled in back to the beginning. It does not give a correct average for the period, but gives an average much more comparable with the following period, than if only the figures from those in milk had been taken. We think that you will agree with us that the differences have been decreased rather than increased by this method.

Method of Feeding

Throughout the entire demonstration the grain consisted of corn meal and bran equal parts by bulk, or about 2 7-9 parts of corn meal to 1 part bran by weight.

During the first period lot I was fed 10 pounds of timothy hay, 13 pounds of grain and 10 pounds of corn stover. During this same period lot II was fed 10 pounds of alfalfa hay, 13 pounds of grain and 10 pounds of corn stover. During the last

week of the first period the grain was raised to 14 pounds. At the end of eight weeks the hay was changed on both lots, lot I receiving the alfalfa, and lot II the timothy. The grain was changed to 12 pounds and the corn stover remained the same for both lots. This food was not weighed to each individual cow but to the lot, then divided nearly equally or according to milk flow.

The records were kept for 25 weeks in all: three weeks before the test started; one week before each period, for the cows to adjust themselves to the change; and four weeks after the close of the second period. The preliminary period of feeding was from Nov. 26 to Dec. 17. During this period the roughage consisted of corn stover and a mixture of alsike clover and timothy.

The first period of eight weeks extended from December 25th to February 18th. The second period of eight weeks extended from February 25 to April 22nd. The charts on page 184 show that it required about three to four weeks for the cows to adjust themselves to the change in the ration. The milk flow increased or decreased very rapidly for that length of time when a more or less constant flow was maintained. Eight weeks is a short period for a feeding test, yet at the end of this time the owner was glad to change the rations, because lot I had lost much in milk flow, in flesh and in general condition. If such a great change takes place in such a short time, it is easy to see why so many of the dairy cattle of Illinois come out of the winter in such poor condition and have a very small milk account to their credit.

There is much in breeding and in the individuality of the cow, but there is also much in careful feeding.

The following tables show the weekly production of each cow and the average for the nine cows in each lot.

Lot No. I.

Week Ending.	Lucy.	Blue.	Black.	Lill.	Joe.	Spot.	Line Black.	Star.	Molly.	Av.
Dec. 3..	*203.0	138.5	202.3	240.0	220.0	210.0	197.5	250.0	218.0	215.5
Dec. 10.	203.0	205.9	203.7	240.0	220.0	210.0	194.2	250.0	218.0	216.1
Dec. 17.	203.1	204.7	206.5	240.0	220.0	210.0	188.6	*251.5	218.0	215.9
Dec. 24..	198.3	192.7	207.6	240.0	215.0	208.0	180.3	248.2	*218.6	212.1
Dec. 31.	192.2	191.6	206.0	240.0	210.0	200.0	177.3	235.2	198.3	205.4

Jan. 7	174.7	157.0	179.4	240.0	*220.6	198.0	177.0	195.5	187.3	191.7
Jan. 14	168.8	172.3	180.0	*234.8	199.0	194.0	173.7	193.2	197.9	190.4
Jan. 21	170.3	180.7	181.1	228.3	205.2	192.0	166.1	188.0	178.1	187.7
Jan. 28	169.5	180.8	186.9	221.8	203.7	189.0	167.5	197.2	186.6	189.1
Feb. 4	172.1	181.2	189.0	209.8	204.1	*185.0	173.2	203.3	176.2	188.4
Feb. 11	174.2	180.5	189.6	212.7	189.1	187.3	172.7	214.2	157.0	186.3
Feb. 18	179.3	184.6	189.5	229.9	194.5	199.4	168.1	212.5	173.1	192.3
Feb. 25	186.5	188.6	190.1	231.0	203.2	199.6	159.6	212.4	181.1	194.6
Mar. 4	192.2	205.0	199.6	231.8	207.3	215.3	172.9	225.0	198.7	205.4
Mar. 11	198.7	212.1	200.5	247.4	215.5	219.7	181.1	233.6	203.2	212.4
Mar. 18	202.5	204.5	202.0	243.0	220.9	220.8	184.4	242.1	186.5	211.8
Mar. 25	206.6	209.9	200.8	243.7	224.7	219.9	175.5	242.8	180.7	211.6
Apr. 1	198.8	208.4	194.8	239.1	220.7	215.4	170.1	239.8	186.1	208.1
Apr. 8	201.8	200.1	195.7	234.9	201.6	216.2	176.5	235.0	202.9	207.2
Apr. 15	200.3	196.8	194.6	240.5	204.9	210.0	173.7	230.0	202.2	205.8
Apr. 22	200.7	208.2	189.2	229.0	229.0	218.0	174.7	225.2	199.6	205.4
Apr. 29	205.3	211.9	194.5	230.4	155.3	*229.4	180.9	236.9	209.5	206.0
May 6	206.8	221.5	186.0	239.7	165.2	231.4	190.1	247.8	207.8	210.7
May 13	204.3	211.0	174.1	249.9	181.8	238.4	194.7	238.2	205.3	210.8
May 20	205.8	212.9	175.4	251.8	192.4	232.3	190.7	241.5	187.9	210.8

*Record started.

Lot No. II.

Week Ending	Brindle	Goldie	Belle	Maud	Pet	Emma	Topsy	Eva	Rose	Av.
Dec. 3	149.2	237.7	195.9	111.0	153.1	178.7	144.1	188.8	179.7	171.2
Dec. 10	151.2	237.7	198.1	120.5	155.1	175.7	149.8	195.4	184.6	174.5
Dec. 17	154.6	237.7	204.3	121.5	148.0	178.6	156.4	206.1	189.9	177.7
Dec. 24	165.2	237.7	213.2	123.6	158.8	184.9	162.3	206.1	191.1	182.8
Dec. 31	162.1	237.7	214.5	127.6	150.8	182.4	159.5	206.4	192.5	182.2
Jan. 7	158.2	237.7	218.0	122.6	147.6	180.8	152.2	199.0	187.8	178.4
Jan. 14	156.7	237.7	219.1	126.7	154.1	182.3	163.6	203.6	192.8	182.1
Jan. 21	166.1	237.7	214.6	126.6	155.8	183.8	162.7	206.7	193.1	183.2
Jan. 28	169.3	*237.7	223.8	128.9	154.0	182.2	170.2	211.2	194.5	186.0
Feb. 4	145.6	237.7	224.8	124.6	145.1	184.4	165.5	213.9	199.9	182.4
Feb. 11	158.1	264.5	221.3	129.5	144.0	183.3	170.0	216.9	201.8	187.7
Feb. 18	161.4	289.6	221.4	136.4	149.4	180.4	168.2	224.8	206.8	193.1
Feb. 25	158.0	267.6	208.0	130.9	149.6	174.4	167.3	209.1	194.6	184.4
Mar. 4	147.8	233.3	185.2	115.7	138.6	155.5	150.5	189.8	172.2	165.4
Mar. 11	139.6	219.5	168.1	112.2	135.8	144.1	149.4	184.2	162.9	157.3
Mar. 18	137.0	221.3	167.2	105.2	139.5	153.0	152.8	184.7	163.6	158.2
Mar. 25	134.4	210.2	164.1	79.6	114.9	147.9	156.9	186.2	161.9	150.7
Apr. 1	135.5	196.5	164.2	59.2	116.2	147.9	154.4	172.2	159.8	145.1
Apr. 8	131.1	187.8	148.9	87.3	117.3	143.4	148.3	156.8	152.2	141.4
Apr. 15	129.7	176.8	158.4	82.7	116.2	134.4	149.5	141.6	154.3	138.2
Apr. 22	123.8	173.8	152.5	75.7	118.2	141.0	142.6	133.2	152.2	134.8
Apr. 29	136.4	188.7	168.7	88.1	128.8	153.3	154.2	115.1	120.0	139.2
May 6	160.0	228.3	188.7	98.1	123.4	178.0	165.8	173.7	187.7	167.1
May 13	177.4	233.7	189.2	114.4	142.8	181.5	180.4	165.7	199.7	176.1
May 20	164.6	235.8	189.8	121.1	133.0	172.5	175.0	159.4	195.8	171.9

*Record started.

Lot I produced 9 per cent more milk during the period fed alfalfa than during the period fed timothy. The average per cow for the eight weeks fed alfalfa was 1,667.7 pounds and the average when fed timothy hay was 1,531.5 pounds. 1,667.7—1,531=136.4 pounds difference. 136.4×9=1,227.6 pounds the loss for the entire lot while fed timothy.

Lot II produced 23.8 per cent more milk while fed alfalfa than while fed timothy. The average per cow for the eight weeks fed alfalfa was 1,475.1 pounds and for the eight weeks fed timothy was 1,191.1 pounds. 1,475.1—1,191.1=284.0 the difference, or loss by feeding timothy. 284.0×9=2,556 loss for the entire lot.

Assuming that this difference would be continued during the entire feeding season of about 6 months, or 25 weeks, the loss for lot I would be 3,836.2+7,987.5=11,823.7 pounds or the loss for 18 cows during the feeding season. 11,823.7÷100=118.24×$1.30=$153.71. This may represent the loss by feeding timothy hay, or profit by feeding alfalfa hay.

Let us figure it another way. The difference in lot I for the eight weeks was 1,227.6 pounds. This at $1.30 per hundred would be worth $15.95. The difference in lot II for the eight weeks was 2,556.0 pounds. This at $1.30 per one hundred pounds equals $33.22. $33.22+$15.95=$49.17, the difference in eight weeks for 18 cows. About 5 tons of hay were fed during this period. $49.18÷5=$9.83 the difference in the value of the hay per ton for milk production, when milk is worth $1.30 per hundred pounds. If the milk were worth $1.00 per hundred the difference in the value of the hay would be $7.56. With another herd of cows these figures might be either larger or smaller.

$153.71, the gain by feeding alfalfa over timothy in this case is equal to 6 per cent interest on $2,573.00. That would be 6 per cent interest on the money invested in 51 cows at $50.00 each.

The great objection raised by farmers is that they can not raise alfalfa. They have not yet tried thoroughly. If alfalfa can be successfully grown in southern and central Illinois and also in southern Wisconsin and cannot be grown in northern Illinois, it is not a question of climate but of soil conditions which can be remedied. If alfalfa can not be grown, grow clover,

either red or alsike. If these cannot be succesfully grown, grow soja beans or cow peas. There are few if any sections in Illinois where none of these crops can be grown.

If three tons of alfalfa can be raised per acre and two tons of timothy and if timothy is worth $12.00 per ton, then one acre of alfalfa is worth $41.49 more than an acre of timothy when milk is worth $1.30 per hundred and $34.68 when milk is worth $1.00 per hundred, if fed with corn stover, corn meal and bran.

$153.71, the difference in profit on the 18 cows would at present prices buy enough fancy alfalfa seed to sow 54.9 acres at the rate of 20 pounds per acre.

Besides the greater returns in milk when a legume hay is fed, the conditions of the cow counts for much. At the end of each period the cows in the lot fed timothy were in poor condition. They had lost much flesh, the hair was rough and they were otherwise in poor physical condition.

A number of the timothy fed cows were off feed more or less at different times. This did not occur with those getting alfalfa.

Those receiving alfalfa showed two or three slight cases of garget, probably due to heavier milk flow.

CONCLUSIONS.

1. In this case alfalfa hay was worth $9.83 more per ton than timothy.

2. If milk had been worth $1.00 per hundred pounds, alfalfa would have been worth $7.56 per ton more than timothy.

3. Cows fed alfalfa keep in much better physical condition.

4. No one can afford to feed timothy hay to dairy cattle.

5. The superiority of legume roughage warrants great effort in its production.

I want to call your attention to another experiment conducted at the station. The dairyman who grows the crops which he can grow easiest has no right to complain if his cows do not yield maximum returns when fed these crops. He may be sure that his cows are working on the same plan that he is. They are doing their work the easiest way and if he is careless in their treatment they will give his returns accordingly.

The facts given in the following pages are taken from an experiment planned for a different purpose, yet they serve as a good example of the difference between a poor ration (no poorer than fed on many farms) and a moderately good though not ideal ration.

Twenty cows were taken and divided into two lots of ten each. Later one from each lot was dropped leaving nine in each lot. They were treated alike except as to food.

The two lots of cows divided as nearly equal as possible with regard to milk flow, persistency, etc. The difference in the milk flow for the week previous to starting the experiment was 11.7 pounds or 1.3 pounds per cow per day. This difference was in favor of lot I. On the other hand there was a difference in fat production in favor lot II. In other words while on the same feed lot I produced a little more milk and lot II a little more fat. Ordinarily we would expect the cows giving the larger amount of milk to fall off more rapidly but this was not the case as will be seen later.

The two lots were started on these rations Jan. 1, 1906, and continued until April 10, 1906, a period of little over 18 weeks. The rations fed previous to this consisted of good clover hay, silage and grain (corn meal, bran and gluten feed).

The ration fed lot I was as follows: grain (2½ parts corn meal and 3½ parts gluten feed) silage and clover hay. These were fed as nearly as practical in the following proportions: 8 pounds grain. 30 pounds of silage and 8 pounds of hay. This ration has a nutritive ratio of 1 to 66.

The ration fed lot II was as follows: grain (corn meal), silage, timothy hay 5 pounds and clover hay 3 pounds. It might be argued that corn meal is too heavy a feed. To avoid this effect it was mixed with the silage. It was found necessary in this case to change the proportions somewhat in the case of individual cows. The nutritive ratio is of this ration 1 to 11. There is a wide difference between the protein contents of the two rations. Note that ration No. I was made up of corn products and clover hay and that ration No. II was made of corn products, clover and timothy hay. Both lots fell off as soon as changed to the new rations, but lot II fell off much more rapidly than lot I (see charts).

It was practically impossible to induce the cows in lot II to consume enough food to supply protein enough for large quantities of milk. We find just such conditions on many farms. When we ask how the cows are fed, we get the reply that they are getting all they will eat. This is often true but they are feeding a ration not relished by the animals or one which does not keep them in good condition, and they cannot expect them to consume large quantities and make profitable returns. Timothy is not palatable and these cows could not be induced to eat large quantities of it. It was cut and mixed with clover yet they would manage to clean up the clover and leave much of the timothy.

Lot I consumed larger quantities of food and with greater relish. Their hay was more palatable, but ordinarily they are not especially fond of gluten feed. The fact is that their ration was not much more palatable on the whole but better balaned and they were consequently in better physical condition. Both lots were given all they would consume, yet lot I, as stated above consumed more food, consequently more nutriments and made cows in lot I off feed, but in lot II frequently some cow was better use of the nutriments onsumed. Seldom were any of the off feed and at times more than one.

At the end of the 18 weeks, all the cows in lot I were in good condition. Those in lot II were in very poor condition. They ran down in flesh rapidly from the beginning and about April 1st we seriously onsidered changing their rations and terminating the experiment.

LOT I.

Amount of Milk Produced Per Cow Per Week and Average.

Date. 1906.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	Av.
Dec. 31	*289.2	242.9	199.6	264.0	316.4	235.0	284.0	320.4	233.2	264.96
Jan. 7.	256.3	234.1	189.3	267.3	295.0	243.6	264.8	338.7	226.7	257.31
Jan. 14	219.6	237.9	178.3	272.4	288.6	236.9	248.2	316.6	201.1	243.28
Jan. 21	230.0	239.7	187.8	257.3	302.3	215.7	251.7	314.8	205.8	244.97
Jan. 28	237.9	246.4	193.0	255.0	310.6	233.5	255.1	322.2	205.3	251.0
Feb. 4	246.3	250.0	188.3	251.8	308.2	242.1	255.6	321.6	207.7	252.4
Feb. 11	243.7	232.2	182.1	250.8	298.7	245.9	243.5	322.6	210.2	247.18
Feb. 18	242.0	238.8	182.6	257.9	309.1	235.0	250.1	329.5	208.8	250.42
Feb. 25	243.9	236.2	188.3	255.3	306.9	245.3	246.6	321.7	211.7	250.65
Mar. 4	223.8	237.7	182.6	255.8	305.2	246.6	234.2	302.0	210.8	244.96
Mar. 11	206.3	220.7	171.0	247.4	287.1	246.5	238.3	293.3	210.7	235.7
Mar. 18	180.1	224.6	173.7	233.9	252.2	229.5	226.8	275.0	195.1	221.21
Mar. 25	191.2	220.7	168.0	229.4	257.9	223.3	219.1	275.4	201.6	220.73
Apr. 1	206.1	226.0	166.6	233.9	265.5	221.1	219.6	265.0	196.8	222.28
Apr. 8	204.9	225.4	160.5	235.4	255.4	229.5	223.1	266.9	188.2	221.03
Apr. 15	202.4	213.1	156.1	230.1	252.1	229.1	219.0	263.8	196.1	217.97
Apr. 22	208.6	216.8	166.2	231.3	246.5	231.2	222.9	256.9	195.7	219.56
Apr. 29	194.3	226.6	151.8	223.6	224.3	225.2	216.5	256.4	197.1	212.86
May 6	202.9	228.4	151.2	216.3	212.8	229.3	218.7	249.8	196.5	211.75
5 days	142.8	162.6	105.2	157.7	158.2	160.7	151.11	180.9	140.6	147.53
Total	4083.1	4317.2	3242.6	4552.6	5136.6	4370.0	4404.9	5473.1	3806.5	4372.9

LOT II.

Amount of Milk Produced Per Cow Per Week and Average.

Date. 1906.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	Av.
Dec. 31	*177.6	184.2	348.0	351.0	329.4	297.8	186.5	213.7	191.7	253.26
Jan. 7	149.6	160.8	300.0	273.0	283.9	259.9	162.3	179.3	178.8	216.40
Jan. 14	137.3	144.9	268.2	253.0	267.4	252.2	149.2	170.8	168.9	201.32
Jan. 21	132.1	132.1	267.3	246.9	259.7	225.2	150.5	164.4	162.1	193.26
Jan. 28.	127.0	126.8	252.9	228.2	245.5	218.4	130.4	165.0	158.7	183.65
Feb. 4	123.8	130.2	241.2	216.0	240.7	208.5	130.5	141.8	148.4	175.67
Feb. 11	120.3	128.9	241.7	198.5	224.9	204.1	132.2	141.5	142.0	170.34
Feb. 18	196.2	112.0	228.1	180.3	210.3	186.5	131.6	136.2	130.7	157.97
Feb. 25	109.8	126.1	227.7	181.5	217.3	179.5	141.7	148.6	134.9	163.01
Mar. 4	99.8	124.9	221.7	179.5	208.3	175.7	139.0	134.2	130.3	157.04
Mar. 11	100.8	123.1	215.2	181.4	198.0	157.6	138.6	137.4	129.9	153.55
Mar. 18	94.3	118.7	191.9	165.5	187.1	159.2	128.5	128.8	114.9	143.21
Mar. 25	91.8	121.0	198.0	164.2	181.6	163.6	131.1	129.9	112.4	143.73
Apr. 1	92.2	118.4	193.1	154.5	182.7	145.2	126.3	128.2	120.9	140.16
Apr. 8	93.2	123.1	199.9	164.5	184.9	145.5	128.4	134.2	133.9	145.27
Apr. 15	87.0	121.8	192.6	156.6	176.1	134.8	121.3	130.7	115.5	137.37
Apr. 22	92.1	119.1	189.4	153.5	177.1	132.2	123.9	132.1	122.6	138.00
Apr. 29	91.8	119.6	183.2	162.4	171.6	136.2	121.0	126.1	120.2	136.9
May 6	83.8	110.0	184.2	154.0	173.1	137.6	120.5	118.2	117.4	134.25
5 days	67.1	69.0	126.4	100.2	121.3	95.7	79.8	68.9	80.5	93.83
Total	2009.1	2330.5	4122.7	3513.7	3910.4	3317.6	2486.8	2616.3	2522.9	2984.93

LOT I.

Amount of Butter-Fat Per Cow Per Week and Average.

Date. 1906.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	Av.
Dec. 31	*9.83	6.60	7.39	8.19	9.81	8.13	9.37	10.59	7.70	8.62
Jan. 7	9.73	6.56	7.19	8.03	8.86	9.26	8.24	10.84	7.26	8.49
Jan. 14	7.47	5.39	6.77	6.95	7.51	8.06	7.46	9.50	6.04	7.23
Jan. 21	7.80	6.48	6.96	7.47	8.16	7.55	8.56	9.45	6.38	7.64
Jan. 28	7.85	7.14	7.14	7.66	8.39	8.18	8.47	10.31	6.58	7.96
Feb. 4	7.88	7.72	6.97	7.55	8.31	8.23	8.69	9.99	6.02	7.92
Feb. 11	7.81	6.78	5.71	7.52	8.06	8.99	8.49	10.27	6.46	7.89
Feb. 18	7.74	6.72	6.43	7.74	8.56	8.30	8.32	10.26	6.48	7.80
Feb. 25	7.39	6.41	6.73	7.66	8.59	8.55	8.35	9.96	6.56	7.80
Mar. 4	6.94	6.21	6.73	7.67	8.81	9.26	8.36	9.92	6.70	7.84
Mar. 11	6.57	6.50	6.47	7.63	9.30	8.73	8.38	9.64	7.15	7.81
Mar. 18	5.92	6.54	6.45	7.25	7.89	8.42	8.13	9.07	6.83	7.50
Mar. 25	6.31	6.40	6.50	7.31	7.99	7.88	8.07	9.09	6.45	7.33
Apr. 1	645	6.17	6.36	7.08	8.00	7.93	7.12	8.51	6.91	7.17
Apr. 8	6.14	5.85	6.09	6.92	7.66	7.80	8.09	8.54	6.39	7.05
Apr. 15	6.07	5.45	6.05	7.36	7.56	8.24	7.93	8.44	6.47	7.06
Apr. 22	6.51	6.05	6.15	7.17	7.39	6.70	8.05	8.22	6.46	6.96
Apr. 29	6.02	6.34	5.78	6.83	8.40	8.02	7.57	7.95	6.90	7.09
May 6	6.09	5.71	5.59	6.21	7.02	7.97	7.43	7.49	6.09	6.71
5 days	4.28	4.31	3.72	4.57	4.68	5.46	5.13	5.13	4.36	4.48
Total	130.97	118.73	119.79	136.58	151.14	153.53	151.28	172.58	122.40	140.09

*Initial week.

LOT II.

Amount of Fat Produced Per Cow Per Week and Average.

Date. 1906.	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	Av.
Dec. 31	*7.81	6.65	10.44	10.90	10.53	11.31	7.27	8.98	9.59	9.27
Jan. 7	8.38	6.59	7.69	7.64	9.08	9.09	6.65	7.90	8.79	7.97
Jan. 14	6.03	4.65	7.23	6.58	7.76	7.44	5.53	6.48	7.51	6.57
Jan. 21	5.35	4.76	6.95	5.91	7.54	6.75	5.41	6.90	6.65	6.24
Jan. 28	5.72	4.45	7.33	6.14	6.87	6.54	4.57	6.43	6.82	6.09
Feb. 4	529	4.56	6.74	4.53	6.74	4.79	4.69	4.98	5.93	5.36
Feb. 11	5.05	4.38	6.97	5.27	6.47	5.57	4.76	5.80	6.04	5.47
Feb. 18	4.47	3.92	6.15	4.72	6.11	5.06	4.85	5.60	5.62	5.16
Feb. 25	4.61	4.40	6.07	4.71	6.11	4.54	5.14	4.93	5.68	5.13
Mar. 4	4.19	4.52	6.24	4.56	6.18	4.67	5.02	5.47	5.58	5.15
Mar. 11	4.32	4.77	6.24	4.87	5.94	4.57	5.22	5.36	5.58	5.20
Mar. 18	4.05	4.43	5.40	4.56	5.77	4.75	4.88	5.35	5.23	4.93
Mar. 25	4.18	4.79	5.71	4.73	5.94	4.76	5.09	5.67	5.17	5.11
Apr. 1	3.92	4.33	5.29	4.21	5.56	3.84	4.96	5.20	5.46	4.75
Apr. 8	4.38	4.43	5.40	4.58	5.75	4.22	4.61	5.44	5.33	4.89
Apr. 15	3.81	4.39	5.20	4.23	5.59	4.56	4.69	5.49	4.62	4.62
Apr. 22	3.96	4.40	4.92	4.34	5.50	3.70	4.58	5.30	5.15	4.65
Apr. 29	3.85	4.54	4.76	4.44	5.49	3.67	4.59	5.29	5.16	4.64
May 6	3.94	4.18	4.18	4.97	4.26	5.01	4.35	4.70	4.70	4.58
5 days	2.82	2.62	3.41	2,86	3.91	3.00	2.99	3.02	3.41	3.21
Total	88.32	85.11	112.65	93.14	117.32	94.39	92.57	105.35	108.40	99.72

*Initial week.

The total milk produced by lot I was 39.386.4 pounds and that produced by lot II was 26,830.0 pounds. 39,836.4-26,830.0—12,556.4 pounds the total difference in the amount of milk produced by the two lots.

If the initial difference of 11.7 pounds per cow per week, had been carried through the entire period it would have amounted to 1,995.4 pounds. This sum taken from 12,556.4 pounds equals 10,561.0 pounds or the difference due to feed.

If milk were worth $1.00 per hundred pounds this would mean a loss of $105.61 or $11.73 per cow. If the 18 cows had been fed the poor ration the loss would have been $211.14.

This would purchase 21 tons of clover hay at $10.00 per ton. 21 tons of clover hay would be 18.5 lbs. per cow per day for the entire time, which is much more than either lot received.

There was also a great difference in the fat produced. Lot I produced 1,257 pounds of fat and lot II produced 897.22 pounds, a difference of 359.7 pounds.

As stated previously lot I consumed more food and made better use of the food consumed. The following figures are based on Henry's table for digestible nutriments. The total digestible nutriments consumed by lot I was 19,425.93 pounds. .493 pounds of nutriments were required to produce one pound of milk. Lot II consumed 17,319.3 pounds of digestible nutriments or .645 pounds for every pound of milk produced. Lot I consumed 12 per cent more nutriments and made 30 per cent better use of the nutriments consumed.

There are at least two reasons why lot I consumed more. 1st, their ration was a little more palatable. 2nd, the better physical condition due to difference in the rations. The timothy hay seemed to be one of the greatest disturbing factors. It was practically impossible to get these cows to consume moderately large quantities of it. There was no difficulty in getting them to take the corn meal and silage with clover hay. This illustrates again the fact, that timothy hay is of little value as feed for dairy cattle and that the legume (clover, alfalfa, cowpeas, etc.) are valuable.

CONCLUSIONS.

The above figures show that yuantity can not be made to take the place of quality in the ration.

A ration not properly balanced tends to bring about a poor physical condition.

A cow in poor physical condition can not consume large quantities of food nor can she make the best use of food consuemd.

Much depends upon the kind and quality of roughage used.

DISCUSSION.

Q.—How were the cows watered during the winter? Were they allowed to help themselves to all the water they wanted?

A.—They were turned out to water twice daily and the water was reasonably warm every time. They were allowed to go to the trough and drink what they wanted. It seemed evident that those given alfalfa drank more water than those given the timothy.

Q.—Were they salted every day?

A.—They were salted every day.

Q.—Were they salted in the feed or allowed to have what they wanted?

A.—The salt was fed with the grain, the same amount to every cow.

Q.—What is the difference in the cost of the two rations?

A.—I have not figured that up, Mr. Mason, but the timothy hay we valued at the same price as clover hay. The ensilage would be the same in both cases. All the extra cost would probably be the difference between the cost of corn meal and the cost of gluten feed, and we paid $20 for corn meal and $23 for gluten meal.

Q. When did you buy your gluten feed at that price?

A. Over a year ago. Gluten feed now is about $27 a ton.

The President:—This is an important subject, one that we are all interested in. It seems to me we ought to have more discussion on the feed, or a few more questions at any rate. You can find no better authority than Professor Hayden.

Q.—Does a person get the same results by feeding alfalfa meal as hay?

A.—We have not tried alfalfa meal, but if it is good alfalfa meal, what alfalfa meal should be, you will get the sme results but you pay more for alfalfa meal than straight alfalfa. They

do not grind it for nothing and put it up in bags. That question of growing alfalfa might be discussed here if you have the time and wish to do so.

Mr. Gregg:—I did not want to discount the value of feeding but the point I tried to make was that it was very difficult to feed quality into an animal. First breed then feed, and your feeding system is the same as we follow at home.

Mr. Long:—This question of raising alfalfa, it seems to me, is an important one and if we have time I think it would be well to take it up for a while. I would like to ask where Mr. Gilkerson got his alfalfa?

Prof. Hayden:—In this case we shipped the alfalfa to Mr. Gilkerson for the purpose. It was not raised here, we shipped it in and fed it against good timothy hay.

Q.—What was the amount of protein you fed those cows?

Prof. Hayden:—I cannot give you that without figuring it out, and I did not do that here. I figured it at home but cannot remember what it was. The difference in protein would be the difference between timothy and alfalfa hay.

Mr. Campbell:—What does alfalfa hay cost laid down here?

Prof. Hayden:—Last year it cost us $19.50 per ton laid down here.

Mr. Campbell:—Can the ordinary dairyman buy it at that price?

Mr. Hayden:—I am not advocating that you buy alfalfa, that is not the point I want to make. You can raise clover hay if you cannot raise alfalfa.

Mr. Campbell:—We can raise alfalfa here as well as it can be raised in any other country.

Prof. Hayden:—Mr. Boyce down here has been raising alfalfa on his place for fifteen years. If that will grow there why cannot you grow it?

Member:—I saw some alfalfa in the North end of the county, if some one here can tell us about that.

Prof. Hayden:—Can anyone who has grown any say something about it?

Member:—I have grown it two years successfully.

Mr. Campbell:—I have raised it successfully but do not happen to live in this county. I live over the line in another county.

Member:—I have raised alfalfa for six years.

Member:—Let the gentleman tell us how he started his alfalfa. I am referring to the man that has been successful with it for six years.

Member:—The main thing I did was to get the soil in proper condition, free from weeds, get a good seed bed. It is a hard thing to start here and as a general thing the people plant a little soon, the soil needs time; it needs preparing. The ground should be cultivated and carefully freed from weeds before alfalfa is sown and after that I think there will be no difficulty.

Q.—Do you use lime?

A.—I did on a portion, and on that part on which I did not use lime I did not get as good stand or as good yield as where I used the lime. I think the difference in the stand and yield was on account of the lime. I sowed mine without a nurse crop and sowed 20 lbs. to the acre. The first year I cut 1,800 lbs. to the acre, I cut it three times and gathered my crop each time. The first crop was hardly worth the gathering, but I gathered it.

Mr. Long—I can tell you how I did with my alfalfa. I sowed my alfalfa with barley, sowing the barley rather late, and I cut the barley and sowed it on the land prepared just as I would on land prepared to sow clover. I got a fairly good stand, worked it two or three years and got a good crop three times. One winter it badly winter-killed, that is it did not entirely winter kill but was killed to some extent and I had a man to plow it up, but this year we got a good crop again.

I believe we can grow alfalfa in this county wherever we can grow clover, and people get discouraged trying to grow clover sometimes. I believe that alfalfa will grow on most of the soil in this county; there may be places where we cannot grow clover successfully in Illinois, and there are possibly fields on my farm where I could not grow alfalfa, there are fields where I would not attempt to grow it when I can raise good corn. I see no reason why any man who will persist in trying cannot grow alfalfa in this county.

Prof. Hayden:—If he cannot grow alfalfa he can grow clover or soij beans. Let me tell what success we have had at the station. The first year we sowed it early in the Spring, did not get anything; it appeared to come up and started fairly well

up in the Spring but the grass got the better of it. We clipped the grass several times during the summer and the next Spring plowed up all but one little spot on top of a hill close to a tree. You had better sow the high land, do not sow the low land where you have water level near the surface. The next year we sowed that again and we got a little better result, got a fairly good stand that year. That year we sowed ten acres. The next year we sowed five acres on a different plan, plowed the ground early in the Spring, then disced and harrowed the ground to kill the weeds, gave them time to germinate and went over them again. That year we sowed about the middle of June and got an excellent stand; the next year we did the same thing but I think we sowed the fourth of July in this case and we got a good stand. Last Spring we disced the soil carefully and about the of July we had that soil in as nearly a perfect condition as we could get it; we sowed 20 lbs. to the acre and we had a fine stand. Last Fall it got up quite high but we did not cut it; it was on a special piece of ground where we wanted to keep a good stand. We let it go and so we have twenty acres of good stand of alfalfa. The first year on the first ten acres we got three or four tons to the acre; the next year we got over six tons of dry hay to the acre. Compare that to your timothy hay. Last year we only got about four tons because the season was colder and much more moist with us and that was not favorable to alfalfa. Now that is our best method, not use a nurse crop but keep the weeds down until later in the season and then sow your alfalfa. We always inoculate the soil, and you can use soil from the place where this sweet clover has grown but be careful to take off the top so as not to get too much sweet clover seed. It seems the same bacteria which work on sweet clover on alfalfa.

Q.—If you had a poor stand of alfalfa would you disc it or plow all the rest of the alfalfa?

Professor Hayden:—Last year I told you one piece was partly froze out. We went on that with a disc, it happened to be a loose piece of ground. We disced it over several times and sowed it again, but when we got through discing there was not much of the old alfalfa left, but we got a good stand on that field.

Mr. Campbell:—How often do you manure your alfalfa field?

Prof. Hayden:—We give it a good oating to start with before we put it in alfalfa. We have no definite rule as to how often we manure it. We top dressed it a little last year and expect to again this year.

Mr. Campbell:—I think the great trouble is that farmers undertake to raise alfalfa on land that would not raise an umbrella in seven years, and consequently they have no success with it. We have to have rich land for alfalfa.

Prof. Hayden:—A good crop of alfalfa will give you about as much nutriments as you will get from a piece of corn, so you have to have ground that will produce good corn if you want to produce alfalfa.

Member:—I would like to ask if it is profitable to use phosphate in connection with the lime?

Prof. Hayden:—I cannot say as to your section, as that varies in different sections. Perhaps someone else can answer that question better than I. It strikes me we have phosphate enough here to grow alfalfa if you get your soil inoculated and in good condition and use enough lime to neutralize the acidity. I do not know whether your section is deficient in phosphate or not.

Member:—The better way is for each one to experiment for himself, because two fields adjoining would not be in the same condition.

The President:—I am sorry to stop this interesting discussion, but we have two other numbers on the program by very distinguished gentlemen and quite a number of questions will undoubtedly come up then.

It seems to me there are hardly enough yellow badges in the audience. You can get these badges at the secretary's desk. For the good of the cause I wish you would all join the association.

I hardly need introduce our next speaker, Professor Van Pelt, whom you all doubtless know by reputation. Mr. Van Pelt was with the Jersey herd at the St. Louis exposition. He has been prominent in our dairy work and we have learned to accept his statements as very reliable. He is certainly a man who knows what he speaks and is an excellent writer. I take pleasure in presenting to you Professor Hugh Van Pelt, of Ames, Iowa, who will speak to us on calf rearing.

Prize Winning Holsteins at 1907 State Fairs.

CALF BREEDING.

Prof. Hugh G. Van Pelt, Ames, Iowa.

Mr. President, Ladies and Gentlemen:

It gives me pleasure to be here and address you at this meeting, for different reasons. In the first place I always like to address people that I can praise and I want to congratulate you in Illinois because of the fact that you are doing things from the dairy cow standpoint. You are working through your legislature in such a manner that you are getting appropriations and means with which your experiment station can work out just such things, as Professor Hayden has just told you. In the second place, I want to say that I very seldom attend a dairy meeting, either in Eastern states or Western states but I hear the Elgin district spoken of; it is so common that it is becoming the rule to hear of your methods at other state meetings as methods which are good for them to follow, and I am glad to be here to learn more of your methods and to learn how you do things. However, even with the methods that you do practice there are undoubtedly things that can be improved upon, one of these I am told is to find some other manner for keeping up your dairy herds, for producing your dairy cows.

We must all bear in mind the fact that in the last few years conditions have changed radically, conditions are always changing. Today you men know that you do not have the same conditions that you had ten or fifteen years ago. About that time it was that you began to practice the buying of dairy cows on the market or wherever they could be found, putting them into your herds and milking them for the profitable portion of one period of lactation, fattening them up and selling them for beef. Very likely at that time and in the time between then and now that was the most profitable and advisable thing to do, but there is a great question at the present time whether it is the way to maintain your dairy herds, and I doubt very much if it is. If you look over Professor Frazier's works you will find he has figured out very carefully and accurately for you that by the use of a good sire you can make an improvement on a cow's daughter of $322.79 for her period of usefulness of six years. That means

something to you. If you can produce a cow that is worth $32.79 more than her mother you cannot afford to try and buy a cow, paying a large price for her, and find she is not equal to the calf's mother in many instances.

There are very many other reasons why buying cows to maintain the dairy herd is not advisable. One of these is lack of uniformity in your herds and as you go on with your work for a life time at the end of your life you have no better herd than when you started with it, notwithstanding that you have learned to select better cows than you did on the start, you have gained experience in selecting cows, at the same time you will find that the dairy cows being milked in the United States have increased from twelve millions to over twenty millions. In other words, we are milking 60 per cent more cows in the United States at the present time than we were 25 or 26 years ago. That means there is a demand for good dairy cows. Mr. Gregg said you were buying cows from men in the West and they did not know any more or as much as you people here and as a consequence he said you were getting the product of their ignorance. That is where you are putting the dairy herds in Illinois when you buy from a man in the West, you are putting into your herds the product of his ignorance. I like that expression of Mr. Gregg's very much, because it is a fact.

I do not wish to take up too much of your time in trying to illustrate the importance of some other method of producing your dairy cows, yet I am satisfied this is an important point and you know it. You realize, when you buy a cow and pay $40 to $60, in more instances $60 than $40, that it is a great expense; you realize that it is very difficult to milk that much profit out of that cow, especially with the beef market going down, so that when you get ready to dispose of her you will need to take a lesser price. I think, taking all these things into consideration, it will be conceded that the manner in which a man must build up his dairy herd and keep it maintained is to raise the best heifer calves from the best cows of his herd. It does not take you very long to find out which are the best cows in your herd and it does not take you very long to find out which are the poorest cows in your herd, and if you are following a business system in your dairy work, as you should if you are working for dollars and cents in profit, you will get rid of those poor cows and keep your

good cows, consequently you do not keep the heifers from your poor cows but from your good ones.

Now if you will bear in mind the lessons you got from Mr. Gregg this morning about the dairy sire, place at the head of your herd a good sire, produce good calves from your good cows and every year you will produce a heifer which in her period of usefulness will bring you $32.79 more than her mother. After a lifetime of breeding what have you in the end? Gentlemen, you will have something far greater in the line of cows than though you disposed of your heifer calves, sold them for beef or knocked them in the head, and continued to buy grade cows that somebody in the West wished to dispose of. We people in the West are learning something, we are learning the value of a good cow. We are learning too that feeding beef cattle, hogs and other farm cattle is risky, to say the least. I was talking to a friend of mine that last year boasted to me he made $10,000 feeding beef cows—last year was an exceptional year. I met him again before Christmas this year and I asked him how he was getting along and he said, "I have lost $6,000 of the $10,000 I made last year, and I have enough cattle so if the price does not change I will lose $6,000 more, so I will be $2,000 further back than if I did nothing this year." That is a fact in many instances.

We are learning the value of a dairy cow over there. We are testing cows, the same as you are here, and when we send a cow over here for you to buy you may consider that cow is one that has been found unprofitable, because there is a great demand in the Western states for the cows which you are after, and we all know that that reason has caused cows to increase in value from $30 to $50 and $60 apiece.

This matter of supplying cows to the herd is a serious one and not one for future consideration, it is a matter that must be considered right now and, as I said a moment ago, the quality of cows that you will have in ten or fifteen or twenty years there is something more that you will have, you will have the reputation of owning good cows, and if this Elgin district, which has the name of being the greatest milk producing portion of the United States, would take on a general line of producing dairy cows, in the course of twenty-five years, if you work as hard at that as you have worked at production of milk, I venture the assertion that you will be the most noted section of the United States as a

district producing dairy cows. That is what made Herfordshire, England, famous. They started there years ago producing cattle and stuck to it, and made themselves known throughout the world. That is what made Percheron, France, famous. They stuck to breeding Percheron horses. The same in the Islands of Guern--sey and Jersey, and if you men get intense in the breeding of dairy calves and raising dairy calves, it is only a course of time until the Elgin district will not only be spoken of as a great milk producing center but as a center for the production of good dairy cows.

Regarding the Rearing of Calves.

There are many drawbacks in raising dairy calves, especially in a district like this. In the first place, you will find many disappointments, you will find disappointments in buying dairy cows. You look at a dairy cow as you see her on the market, select her, take her home and in many instances you are disappointed.

She is not the kind of cow you thought you were getting, turns out to be unprofitable. The same holds true with the dairy calf in a few instances, even though you retain only the calves from the most profitable cows, but these disappointments are few.

Probably the worst drawback is the care and attention that is required in raising calves. Now there is no use in trying to raise a calf well, to give it a good big barrel, if you do not intend to give that calf proper care, nourishment and attention. I wish to say that the time for a man to begin figuring on the calves that he wishes to carry through to a profitable stage is sometime even previous to the birth of that individual.

We hear a good many breeders of dairy cattle boast of the persistency with which their cows milk. You hear men boast of the fact that they have a cow that milked up to the time of freshening, never went dry. I am satisfied the man who practices that system is making a mistake. We must realize the fact that the young animal and growing animal and different things are made up of the same food constituents; we must bear in mind the fact that the last six weeks or two months of the period of gestation, the calf is making its largest growth, and if we milk the cow persistently she is throwing her food off in one of three directions, she will either keep up her own bodily strength, supply the young calf or manufacture her food into milk, and if she manufactures her food into milk she is either robbing her own body or the calf,

and so far we find that where cows are milked persistently up to the time of freshening the youngster is not strong when born, comes in a weekly condition, susceptible to all the calf diseases, scours, cholera, etc., that we find among calves; and I want to say that the difference in the health, strength and vigor of dairy calves and beef calves is because in the former case we use the milk bucket and milking machine and rob the calf before it sees daylight, so I am satisfied the best thing to do is to turn the cow dry four to six weeks before freshening, and then begin feeding her at that time with a special purpose.

I have no sympathy whatever with the man that feeds any animal simply for the purpose of giving that animal food. When we start to feed anything we should feed with a purpose. If we are feeding for fat to lay on a steer feed for fat and then bear in mind the things that make fat are carbohydrates. If you are feeding for growth of the young animal, whether a pig, calf or colt, remember there are only two constituents in the feed which that animal makes use of for the purpose of making growth, and that is protein and ash. Protein grows muscle, builds up blood, grows hair, hoofs, bone, etc. Ash enters in to assist in growing bone. Other elements of food never take the place of protein and ash. The man that feeds carbohydrates at the expense of protein is making a mistake because he is giving that calf nothing to grow on, much as you would try to build a brick house out of wood. He would come as near doing it, but he might try for a life time and never get his brick house built out of wood. So when a cow is turned dry, begin feeding not only for the building up of her strength and power for the next period of lactation, but bear in mind that you are feeding at the same time an infant and growing animal. The feed you supply that cow during her resting period will be paid for a good many times after she freshens next time. I have found that a cow freshens in a poor, weak, emaciated condition, tests low and the butter fat content is not as high as though she were stronger and in better health and condition. She does not give so much milk and the greatest trouble of all is she will lack persistency. She has not the strength, the power and energy to go ahead for ten or twelve months and milk profitably. She declines in the milk flow and it is only a period of a few months until that cow is milking unprofitably or is dry. So have the cow in a healthy condition and then she starts off

milking with a milk rich in butter fat and also solids not fat.

Then, too, you should bear in mind the fact that the young animal is made up almost entirely of protein and cartilage tissue. If you learn that bone, hair, horn and hoofs are built of protein, you must be impressed with the fact that what that cow needs is food rich in protein if she produces the results you desire.

After the calf comes to our barns we have other problems to solve and I am satisfied the best system of management is to allow the infant to remain with its mother two or three days. This is good not only for the calf but for the mother. The process of nursing relieves the udder of much of the inflamation present, especially in young cows, then too the youngster gets the first milk. After the second or third day it is wise to take the calf away from the cow. There is no time when it is so easy to teach the calf to drink as during the second and third days of its life. After a calf is taken away from its mother, I doubt very much whether it is policy to try to teach that calf to drink inside of twelve hours, whether you would accomplish anything more than to lose your temper and a small portion of your religion, so I think it is well to wait. When you commence to teach him put two fingers in his mouth, then he will soon learn how to drink out of the pail; if you take only one finger it is liable to be five days before he learns to drink, but with two fingers he will learn inside of five minutes.

After allowing the calf to have whole milk for probably the first ten days or two weeks, it can be gradually changed to skim milk or some other nourishing product that will give the growth, and for a dairy calf, as soon as it gets to a stage where it can handle skim milk to the best advantage, it is preferable to feed skim milk than whole milk. I know a great many wealthy men in the East would rather see their calves drink whole milk than skim milk and as a consequence you never heard of one of those men raising a good calf. At the end of two weeks the calf should be taking practically all skim milk. Professor Hayden said, "Remember do not ever try to make up for quality by quantity." Do not think because your skim milk has not the fat that you can overcome that by supplying a great amount. It is a good thing to bear in mind never to feed a calf more than 20 lbs. of skim milk a day. I would rather throw skim milk away than give a calf more than 20 lbs.

a day, because when you exceed that you are liable to create scours or something that is difficult to stop. It is best in starting the calf even on new milk to give it five pounds twice a day or four pounds three times a day; it is better to feed a young animal three times a day than twice a day. Later there is no benefit in feeding more than twice a day, then feeding eight or ten pounds twice a day you will have accomplished the results you require.

I have found a good plan in feeding skim milk to put in from a teaspoonful to a tablespoonful of soluble blood flour. In the first place, it prevents and checks scours, which is something for the dairymen to consider. When I fed blood meal or blood flour I never knew a case of calf scours to occur. Then if you have your blood flour analyzed you will find it contains a large amount of protein and a large amount of mineral matter in the form of phosphate, which are what you want to grow bone and muscle, and even then I would not advise feeding a large amount for that purpose because you have protein and mineral matter in your skim milk. If you are feeding skim milk and blood meal it is only a short time until the calves want food stuff of more solid nature than is advisable to begin feeding the calf. This time occurs at different periods with different calves. Some calves begin nibbling at their bedding or some hay that may lay about the stalls at two weeks old, others at four and the majority in the neighborhood of six weeks.

There should be some alfalfa or clover hay placed in front of the calves at this time and alfalfa is better than clover, but I would never put timothy hay before them, if I could sell the timothy and buy something else rich in protein. It is not advisable to feed your calves timothy hay but it is advisable to feed them alfalfa or clover.

At this time you will find the calf will begin eating grain; probably you will notice when he gets through drinking his milk he will turn around and if there is another calf in the stall he will grab him by the ear and begin nursing. That is a bad practice; the calf gets air in the stomach and gets colic, so we try to guard against that and the way to do this is to take some ground feed and as soon as the calf gets through drinking, open his mouth and put a little on his tongue. Then he will begin to look for something else to eat, and then if you have a nice clean

box in the stall some place and begin putting in some feed, the calf will invariably go to that box as soon as he gets through drinking and begin nibbling at the hay. One of the best mixtures at this time is whole oats and shelled corn. We find the digestive apparatus of the calf has some property about it that makes it possible for him to digest whole corn and whole oats, while in the older animal this is not true. The calf digests shelled corn and whole oats to good advantage, it develops and strengthens the digestive apparatus and I know of no reason why the calf should not receive whole oats and shelled corn instead of receiving them in ground condition.

Experiments carried on some years ago at the Iowa Experiment station demonstrated the fact that corn was more valuable to feed to the dairy calf than oil meal, because oil meal is rich in protein, so is skim milk, and one does not balance the other up; but when you feed corn with the skim milk you balance up the ration for the calf. Of course there comes a time when you could feed too much corn and you must guard against that. It never does to feed an animal so much carbohydrates as to get it in a fleshy condition and train it to habits we do not care for.

When the calf begins eating roughage it should be supplied all the alfalfa or clover hay it can consume. Silage keeps the calf in a healthy condition. When we want good blood we go to the old country after it and one reason for that, I am satisfied, is that they feed large amounts of succulent foods; they do not feed silage over there because they have different conditions. They feed root crops, sugar beets, mangles, etc. Over there land is high and labor is cheap, so they put their labor to work on high priced land, raising roots and raising a lot of them to the acre. Succulent food keeps the animal in a laxative, open condition, keeps the beast in a good, sappy sort of condition the same as our animals are in on pasture land. In this country we have high priced labor and low priced land and we cannot afford to raise roots here to feed to live stock to the same extent they can there, because they would cost us too much per ton, but as a substitute for the roots we can raise silage and I am satisfied, even with you men in the Elgin district, even if the condensaries will not allow you to feed silage to your cows I do not suppose they will object to your feeding it to your calves, so you will find

a silo for calf feeding a useful adjunct to the farm. Calves like silage, they eat largely of it, so there you will have a ration for your calf which it will be difficult to better, that is simply by feeding skim milk, either ground corn and ground oats, or whole corn and whole oats, corn silage, clover and alfalfa hay.

In summer, of course the calf should be allowed to run to pasture. It should get exercise at all times, there is nothing that appreciates exercise more than a young animal. House a child up and it becomes puny, no matter how well it is fed or dressed. If you keep him in the house all winter by spring he has not the health and vigor that the young child has that plays out doors a portion of every day the whole year. The same thing holds true of any young animal and holds true of the young calf. We should always provide a yard, properly sheltered from the cold winds, where these youngsters can go and play and be out in the sun light quite a portion of every day.

There is another thing to bear in mind, that is developing capacity of the calves. There is nothing we appreciate more in our cows than capacity. You remember Mr. Gregg told you that when his animal was even a calf it came away down. We prize that. You will find judges in the dairy ring when judging dairy cows want an animal with a good barrel. When you buy a cow that is one of the first things you look for, to find an animal with a large barrel. You know an animal that does not eat a large amount of food does not digest and assimilate any more, and the amount of milk and butter fat an animal produces is in proportion to the amount of food she can consume, digest and assimilate, so we should not only breed for this but we should feed for it, and nothing is better for that than alfalfa hay or corn silage during the first and second years.

After a calf has passed through the calf stage, I doubt whether it is necessary to feed it more grain or not. If a Fall calf, by the next Fall it has sufficient size and capacity and digestive apparatus so it can live on the roughage which otherwise would be wasted on your farm, so by following these suggestions you will find the calf has cost you little to raise. Has cost you skim milk, a very small amount of grain in the way of corn and oats, a small amount of anything but roughage in the form of clover or alfalfa hay, silage and pasture grass. The second winter it is possible for it to consume a great amount of rough-

age in the form of corn fodder silage, the second year especially good silage which does not contain a great amount of whole corn.

I think by following up this plan, every time selecting a better sire, breeding every generation up a little higher, a little closer to pure bred, selecting your sires with a little more care, it is only a question of time until calf breeding will become a pleasure to you. It will be a pleasure to see a calf grow up and produce more milk than its dam, and in turn it will be a pleasure to see this cow's calf grow up to cowhood and produce more milk and butter fat than did the calf which you previously raised. Those things are possible, it is only a matter of providing care and shelter for them and supplying the necessary attention, which, as I said in the beginning, is necessary and there is one thing that possibly I did not touch on as strongly as I should, and that is the shelter for the young calves. Young growing animals need a great deal of sunshine, direct sunshine, so I doubt whether it is not a necessity in raising young calves to have a small calf barn on purpose for the calves to rest in. It should always be dry and it should be light, the sun should strike every foot of it at some time during the day. This can be done by windows along the sides of the barn. Sunshine is a great destroyer of germs, and in turn germs are great destroyers of calves. Most of the diseases with which calves are affected are germ diseases. They are affected by cholera and scours, caused directly by different germs, so we need to keep the calves in a pure, healthy place. If we keep them in a dark place, when they come to the age when they would be most useful they are affected by tuberculosis, so that we need to look out for shelter.

As I said, scours are brought about by germs but the germs act quicker when the animal is delicate than at any other time. The best possible way to guard against scours is always feed the milk at the same temperature, at probably about 90 degrees or as it would come from the separator immediately after milking. If the milk is kept at the same temperature every time scours are not as likely to occur. The foam should be brushed off the milk and we should be careful about the pails in which we feed the milk to calves. If you allow the milk to get sour dirt accumulates in the pails. If the pails are not washed they accumulate dirt and filth and cause the growth of bacteria and germs which would kill a human being, so that is one thing to

guard very closely against. If scours do occur, I think the experience of different experiment stations is that the best thing to use is formaline, one part of formaline to four thousand parts of skim milk, is the best cure for calf scours. This was tried in twelve cases, and out of that number eleven cases were cured inside of three days. This is a thing to be borne in mind because a large percentage of dairymen lose calves from the effects of this one disease.

I do not know that there is any reason for my going farther into this discussion. I might talk the rest of the afternoon and not strike any specific point you wish to hear about. If there are any certain things you would like to ask about, I would be pleased to do the best I can to answer your questions.

Discussion.

Mr. Mason:—In this district we sell our whole milk. When we can sell it for $1.60 per cwt. it is dear calf feed.

Mr. Van Pelt:—It is extremely expensive feed and I doubt whether or not you could afford to raise calves on milk costing $1.60 a hundred. It seems to me there is a possibility of selling cream. It looks as though there would be a possibility of working up cream trade, so you could take one milking, separate it and sell the cream for as much as you could get out of the milk, keep the skim milk at home and feed it to your calves in the morning, if you separate in the morning; retain the rest of the milk in the same cleanly manner you would keep any milk, heat it up to the same temperature at night. Then you would have half your milk to go to the condensary and half to feed your calves, and I dare say the latter half, selling the cream, would be more profitable.

Q.—Have you ever tried any of the patent calf meals?

Mr. Van Pelt:—I have had some experience with different calf meals but I have never fed meal without feeding some milk with it. I expected this question to come up and I want to say the man that can prepare some sort of calf feed that will raise as good calves without milk as you can raise with skim milk has made a fortune like the man that invented Peruna.

Member:—This territory, anywhere within fifty or sixty miles of Chicago on the C. & N. W. or the roads running West and North, is all milk territory and it would be a breach of contract with the city dealers to retain part of the milk, so we have

not many using skim milk in this district except during May and June, and I would like to have you give us a composition including the use of ground flaxseed meal. I had hoped when you were speaking about blood meal you would say something about the use of flaxseed, because of its high content of fat. Will you give us a composition that will take the place of skim milk?

Mr. Van Pelt:—At the Iowa experiment station we found that ground corn meal supplied this fat that was taken out when the butter fat was taken, cheaper and more efficient than even flaxseed meal but you cannot begin with that. I looked this point up and found some years ago a man by the name of Stuart made a hay tea, and it seems very reasonable to believe that would make an exceedingly good food for calves. He took hay, clover or alfalfa would be better; he mixed in that a tablespoonful of flaxseed and a tablespoonful of wheat middlings, then poured water over it and boiled it. You can get that any strength you wish up to a certain point by boiling it down. You take all the nourishment out of the hay, the middlings and flaxseed, and by boiling it down you get a certain specified strength. Later he increased the middlings to one-half pound, then to one pound; the flaxseed was increased to ½ pound, so finally he was making a mixture of hay, ½ pound flaxseed and 1 lb. middlings, and he found for the first six or eight weeks his calves made something over two pounds daily gain, which is a larger gain than as a rule we get with skim milk. That comes the nearest to being a substitute for milk that I know of, and it is a cheap substitute. Flaxseed supplies the fats, the middlings supply what carbohydrates are necessary, and the protein is supplied by clover or alfalfa hay, and most of this protein and fat is soluble in hot water and is found in the liquid taken from the moisture after boiling. I think that is the best substitute for skim milk for feeding calves that I know of.

Member:—Is it not a fact that in Denmark, England and Scotland where they are famous for cattle, ground flaxseed meal forms a large portion of their feed?

Mr. Van Pelt:—Over there flaxseed would be cheaper for them, but in this country corn is so cheap that it makes a difference. Most of the foods on the market sold as calf foods are largely either oil meal or flaxseed, and the poorer ones have flaxseed as their basis.

Member:—How about experiments with cod liver oil?

Mr. Van Pelt:—There have been experiments with cod liver oil but they have not been so successful as hay tea. Cod liver oil could be fed to a certain amount but a small amount of cod liver oil will affect the digestive apparatus and they do not do as well as on skim milk alone, it does not seem to be palatable and the calves will leave the meal on which cod liver oil was placed.

Mr. Gregg:—How do you check the habit of sucking?

Mr. Van Pelt:—In going over that matter I said that as soon as the calf gets large enough to eat grain to throw a little ground grain in its mouth. Up at the college we have for each calf small stanchions with cement manger running the full length of the barn. When a calf wants his milk we set the bucket down in the manger, he comes through and we close the stanchion up and he does not get his head out until he starts eating the grain, and as soon as he commences eating the grain there is no more trouble.

Mr. Gregg:—There is a period when they cannot take the whole grain.

Mr. Van Pelt:—Probably the best thing then is to keep them in the stanchions until the taste goes out of their mouth.

Mr. Gregg:—I had some but I made a muzzle for them and fixed them that way.

Mr. Van Pelt:—That is a thing that causes a good deal of trouble.

Member:—I would like to refer to the statement you made about the resting period of the milk cow, in regard to feeding the cow. Is there not more danger of losing such cow after freshening than when we cut the feed short during the resting period?

Mr. Van Pelt:—I did not bear as much stress on that as I would have done had I been talking of feeding the cow herself. A few years ago that advice would have been erroneous because a cow in a fleshy condition at calving time is more susceptible to milk fever and we used to find, and do find yet that fleshy cows have milk fever more often than the cows that freshen in a poor condition, but at the present time we have no fear whatever of milk fever. Really I think when a cow freshens and has milk fever it is a good indication that she is going to produce a good

year's work, and we keep on hand the milk fever outfit ready just as soon as the first indications appear. We fill her udder with air and inside of two or three hours everything is over. In feeding the cow at parturition time, it should be remembered that she is feverish at this period and liable to be in a bound up condition, and one should govern the foods in order to keep the cow in a laxative and cooled out state. You should also remember that she has practically passed through a period of hard work, a severe campaign we might say. Her digestive apparatus has been taxed to the limit, she has been fed all she could consume and make milk out of. You should try to rest her digestive apparatus as much as possible, feed her cooling foods, and if this period occurs during the summer months there is nothing better than good green grass and plenty of it; during the winter months there is nothing better than corn silage and bran; both are laxative and cooling to the digestive organs, flaxseed meal is also good, and by feeding those you will keep your cow cooled out, so to speak, and she will not be so susceptible to milk fever as she otherwise would be. In case these foods are not sufficient to keep her in a laxative condition, it is well to give her either a pound of salts a day or two before calving or a quart of raw linseed oil. I favor linseed oil because you are supplying the cow with nourishment at the same time. I do not think we need worry any more about milk fever if we have on hand a milk fever outfit and I think the gain we make by having the cow fleshy overcomes the dangers which we are likely to incur.

Mr. Gregg:—The man on my farm uses a bicycle pump.

Mr. Van Pelt:—That is all right but there are precautions and that is we must be careful not to affect the udder. The first time my attention was called to this was at St. Louis, it really happened before I went there. At that time we did not know about the air treatment and one of the men inserted a milk tube into the cow's udder, filled her udder with oxygen, which relieved her; but in a few days her udder swelled up, got hard and sore. He had infected the cow's udder, probably from his hands, and in inserting that milk tube into the cow's udder the germ went with it and started to work up there and ruined the cow. So that is a thing we need to be careful of in using the bicycle pump or milk fever outfit. The outfit is somewhat safer because in the middle of the tube there is a piece of sterilized cotton

through which the air strains before entering the cow's udder, so no germs from the air will penetrate the udder; then, by boiling the tube ten or fifteen minutes before inserting and keeping it sterilized by 5 per cent solution or something of that kind, there is no trouble whatever in regard to injuring the udder.

Mr. Janes:—Did you bring up the question of calf feeders at all?

Mr. Van Pelt:—What is your experience with calf feeders?

Mr. Janes:—I related our experience pretty fully last year. Our experience has been very satisfactory with them with young calves, and I would not think of raising calves without the calf feeders, at least for the first six weeks.

Mr. Van Pelt:—Don't you think there needs to be a great deal of care and attention paid to calf feeders to keep them clean?

Mr. Janes:—There certainly does, the same as anything else one uses.

The Chairman:—I am sorry we have not time for more questions. I hope Professor Van Pelt will be with us during the remainder of the sessions so that you can go to him personally for any information you desire.

We will now take up the next subject on the program, which will be discussed by Dr. H. R. Ryder of Chicago. I know of no more important point in dairying that the health of the dairy cow or health and sanitary condition of the milk, and we will now listen to Dr. Ryder on this subject.

DAIRY CATTLE FROM A HEALTH STANDPOINT.

Dr. H. R. Ryder, Chicago.

Mr. President, Ladies and Gentlemen:—

We heard this afternoon how to develop the cow and how to develop the machine for making milk, we have also heard how to feed her and now I come to warn you not to overdo it. Of course we want to develop and want to feed, but if you overdo these things you will get into other trouble, so I take up this afternoon a short paper on diseases of the udder and if you will permit me I will read the article and if you desire to ask any questions I will be glad to do what I can to answer them.

DISEASES OF THE UDDER OF THE COW.

By Dr. H. R. Ryder, Chicago.

Diseases of the udder of the cow are more common than formerly, due to the greater development and increased work of the udder together with modern ideas and methods of stabling, feeding and caring for the cow.

The twentieth century method is to get out of a thing all there is in it, and this method is being applied to the cow. The dairy cow's business is to give milk, she is bred, she is fed and she is cared for to give milk, and if she don't give milk she finds her way to the slaughter house.

The udder is the part of this cow machine that is called upon to do the great bulk of the work in the production of milk and naturally this is the part that shows weakness under the strain in the form of diseases of various kinds.

In developing the heavy milking strains of cows not only has the body and capacity for digesting and assimulating foods been developed, but also the udder has had a proportionately greater development—so that many cows have enormous udders. This increased size renders this gland not only more liable to disease but to wounds and injuries.

Let us consider for a few moments some of the more common wounds and injuries to the udder.

Cause.—Blows or kicks from another animal or from an angry milker, hooks by other cattle, wounds from a thrown stone or pitchfork. Cows sometimes fall and land in such a position, or on hard objects such as stones, sticks, stubble, etc., that they injure or wound the udder. They may lie in such a position that undue pressure is brought to bear on this gland thereby rupturing some of the small blood vessels. Injuries from barb wire cuts and lacerations are frequently met with, but perhaps the most common and troublesome of all injuries at this time of year, when the cows are in the stable, are those from a cow stepping on the teats or udder of her neighbor.

Symptoms.

Many times the wounds and injuries are slight and involve only the superficial structures of the gland and no well marked symptoms are present. In these cases no special treatment is

called for, as nature under favorable circumstances will soon effect a cure. In the more severe cases the injuries are usually noticed by the milker on sitting down to the cow to milk or by the uneasiness of the animal while milking. On examination of the udder it may seem hot and the cow evince pain when the udder is handled or manipulated. Cuts and contusions are readily recognized. On careful examination, hot sore, swollen areas are located which are superficial or deep depending on the nature and severity of the injury. Where the substance of the gland is involved, many times the first thing that gives warning of an injury is blood streaked milk from the quarter, this being due to the rupture of some of the small blood vessels in the part.

Treatment.

There is nothing that affords greater relief, and so quickly, as application of hot water poultices to wounded or injured udders. Woolen cloths wrung out of hot water and held against the affected part several times daily will be followed with good results. Where the pain or soreness is excessive an anodyne (opium or belladonna) may be added to the water. Follow the applications of water with soothing ointments or anodyne liniments. These should be rubbed in well and the udder gently hand rubbed. Belladonna or camphorated ointment is a very valuable remedy where the pain is severe, or the tinctures of belladonna or opium may be applied direct where necessity demands it. It is better not to resort to extreme measures if they can be avoided as the results from these heroic measures are often injurious to the gland.

Cuts, lacerations and contusions are treated in the cow the same as in man. Where the wounds are large and gaping they should be washed out with clean water, and antiseptics, all ragged edges removed, and the wound sewed up. Adhesive plaster may take the place of sutures in certain cases. The most troublesome cuts and injuries are those that involve the canal of the teat and especially where the cow is in milk. The aim in these cases is to avoid the closing up of the canal. The injured sides of the canal must be kept apart to avoid their growing together. Several devices have been used for this purpose, such as spring teat dilators, gutta percha bougies, pledgets of cotton, teat tubes, etc., with more or less success. Care should be taken that these should be perfectly clean and aseptic before

inserting them, or far more injury than good will result. Where the milking tube is used in these cases extreme care should be taken that it be made aseptic by boiling it in bicarbonate of soda (salaratus) and oiling it with carbolized vaseline before it is used, so as not to infect the udder. Then insert it with a rotating movement and with great care. The tube should be used only when it is necessary to draw the milk in cases of wound or injury.

Antiseptics either in the form of ointments or liquids should be applied, this depending on the form and position of the wound.

Congestion of the Udder.

Congestion of the udder occurs in heavy milkers before and after calving.

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Cause.

It is caused by stagnation of blood in the udder and the oozing of the fluid parts of the blood into the surrounding tissues.

Symptoms.

This condition is characterized by large dropsical swellings of the udder and along the abdomen. When the fingers are pressed against the udder, in this condition, depressions are made which remain for some time after the fingers are removed.

This condition is so frequently seen at the time of calving that it is looked upon more as a physiological condition than as a real disease, as it usually disappears in a few days without treatment. It is looked upon as a disease only when it terminates in inflammation.

Treatment.

Usually no treatment is necessary, as the dropsical swelling soon disappears after the milk flow becomes normally established.

The swelling can be greatly reduced and absorption stimulated by gentle hand rubbing and massage (kneading) of the dropsical parts. Frequent milking to stimulate the secretion of milk is very important.

No internal treatment is called for in these cases unless the animal becomes costive. Then a laxative should be given, followed by small doses of saltpeter.

Mastitis or Inflammation of the Udder.

This disease is commonly known among dairymen as "garget."

Symptoms.

Unfavorable terminations of wounds, injuries, surgical operations and congestion of the udder are frequent causes of mastitis, while other causes are exposes to cold, sudden changes of weather, improper milking, either by hand or machine, over feeding on heavy feeds, such as cottonseed meal, peas, beans, corn meal, moldy foods, etc., in fact, it may follow any systemic disease of the cow when she is in heavy milking condition.

The most prolific cause is germ infection through the teat or through the blood or lymph streams.

Symptoms.

The symptoms depend on the cause of the disease. If it follows wounds, injuries or operations all the symptoms manifested in these lesions will become worse and should the disease take on a severe form systemic symptoms would be manifest—elevated temperature, increased pulse, and possibly loss of appetite. While if it is the result of cold, exposure or overfeeding, constitutional symptoms are the first to attract attention—such as chills, fever, loss of appetite, arched back, staring coat. The horns, ears, nose and legs alternately cold and hot. The udder becomes swollen, hot and painful.. The milk may be tinged with blood or almost entirely suppressed and containing clots of milk.

Where the disease is due to germ infection usually one quarter is attacked and the lesions are deeply located in the substance of the gland. The milk is flaky or contains clots or strings of milk. On manipulation swollen, hard, painful areas are found, deeply localized in the one quarter.

There is a contagious mastitis due to a germ that may attack one cow after another until the whole herd has become affected. The symptoms are similar to those just described in germ infection. The only way to positively diagnose this disease is by means of the microscope or to note that one cow after another is attacked with the same lesions of the udder.

Treatment.

Where the inflammation is the result of wounds or injuries the treatment recommended in these cases should be applied with greater care and thoroughness. If the disease is the result of

exposure to cold, the first effort should be to make the cow comfortable. Chills and fevers should be overcome by hot stimulating drenches of ginger or pepper tea, four ounces of alcohol in a quart of water, etc. Cover the body with blankets and rub the body and legs with wisps of straw to equalize the circulation.

The internal treatment after the chills have passed should consist of—

Epson salts	1 pound.
Ginger	1 tablespoonful.
Water (hot)	1 to 2 quarts.

Give at one drench. Follow this with one ounce doses of saltpeter twice daily.

Phytolacca (poke root) has been highly recommended in Mastitis, as it is supposed to combat pus formation and to relieve the pain and induration of the udder.. It is given three times a day in one ounce doses of the fluid extract.

Where the disease is due to over feeding the above laxative should be given followed by doses of saltpeter. A change in feed should at once take place, or a very light ration should be allowed of the concentrated feeds.

If the disease is due to infection, ½ to 2 ounce doses of hyposulphite of soda should be given to a pint of water three or four times a day.

Local Treatment.

Local treatment to the udder should consist of soothing applications. Hot water containing antiseptics (sulphate of zinc, acetate of lead, boracic acid) may be applied with excellent results.

A soothing and very good application may be made by dissolving one-half or a cake of hard soap in three pints of hot water and allow it to cool till the hand can be held in it, then add two ounzes each of fluid extract of belladona and phytolacca and stir thoroughly. Apply while warm to the udder. The milk should be drawn frequently. Should the udder be very sore and painful tincture of opium may be applied direct to the gland. The application of lard to an inflamed udder often affords relief.

The treatment in cases of germ infection is much the same. In these cases antiseptic injections directly into the udder through the teat may be tried. Dissolve two ounces of boracic acid in one quart of boiled water and inject it into the udder. Extreme care should be used so that the gland is not injured.

The unfavorable termination of mastitis is abscess formation or gangrene of the part. Should an abscess form it should be lanced as soon as possible and the contents evacuated. The cavity should be injected with antiseptics till the wound has healed.

Gangrene.

Gangrene is where a part or all of the gland dies. This disease often terminates fatally where a large portion of the gland is involved. The affected part becomes blue or purple red, cold, and sensation is partly or entirely gone. The milk from the affected part is dirty brown in color and has a putrid odor.

Treatment.

The treatment in cases where the disease is well developed is of little avail. Antiseptics internally and externally should be used freely.

Cow Pox.

There is a contagious disease that attacks the udder and teats of cows known as cowpox (variola.) This is a form of inflammation of the udder that principally involves the skin, although it may affect the deeper tissues. It is characterized by the formation of small vexicles or blisters which contain a straw colored fluid. These vexicles pit, or a depression is formed in them after three or four days; this is followed by the formation of a yellow pus which dries down into a scab. The sore slowly heals and after a few days the scab drops off. Where these blisters form on the teat they are usually broken by the hands of the milker and a raw sore is formed which heals very slowly on account of the constant irritation from milking.

Treatment.

Cowpox usually runs a short course and terminates in recovery, so the only treatment called for is that which will assist in healing up the sores; strong carbolized vasaline is perhaps as good as anything. Caustics may be applied where the sores become indolent.

The preventive treatment in this malady as well as in contagious mastitis is far the most important. The well animals should be separated from the disease and the affected cows should be milked last.

As a precautionary measure in the dairy it is advisable in all cases of eruptions, sores or diseased udders to milk such cows last and thereby avoid any possible chance of transmitting the disease from one cow to another.

DISCUSSION.

Member:—A few years ago I had a cow whose teats were all rough from cow pox.

Dr. Ryder:—They come in scabs. Most of you know what it is to have one of those pits because this cow pox is used for vaccination.

Member:—What about the garget outfit?

Dr. Ryder:—If you use those things as directed they are usually beneficial. Garget as a term now includes most of the diseases of the udder. The real garget, as the term was first used, meant a certain disease of the udder, but now it means inflammation and several other things, and the remedies used are antiseptic and the injection is in the teat, as I understand it.

Member:—What is the cause of cow pox?

Dr. Ryder:—It is supposed to be due to a germ. It is traceable to man and it is used for vaccinating people. The germ has never been discovered so as to know it is there, but it has all the characteristics of a germ disease, that is it spreads from one animal to another, so that without a doubt it is of bacteria origin.

Member:—One point I have had considerable trouble with the gentleman did not touch. I do not know whether it comes under the head of inflamation, but it comes under the head of big trouble. The first you know the cow milks hard, bye and bye the end of the teat is a little sore, and after a while it gets so we cannot milk that cow at all.

Dr. Ryder:—That is a form of contagious trouble. I have seen that where it passed through several dairies. I think it is really contagious because it has been transmitted by inoculating one cow after another. A good many times that extends up the duct of the teat, and sometimes extends up the whole length of the teat. Usually they close up.

The Chairman:—Would it be of any benefit to lance that or use a teat blister?

Dr. Ryder:—The teat blister is all right if you take pains to heal them up, and now they have an instrument that runs into

the end of the teat and dilate it by pressure. They put this instrument into the end of the teat and try and dilate those muscles without injuring the skin, and in a great many times better results are obtained than to cut them. I have seen where the teat tube has been used and when the cow lies down on the teat tube there is trouble.

Member:—Did you ever hear where they used one of those dilators successfully and have the teat good for anything?

Dr. Ryder:—Where the dilator is used there is no wound.

Member:—I want to ask the doctor whether he recommends the use of vaseline for congested udders or a mixture of glycerine and alcohol. I presume he knows that most ladies have learned the value of a mixture of glycerine and alcohol in caring for their hands, and I have found it useful in treating cases of that kind.

Dr. Ryder:—I do recommend it and there is another remedy which they would receive great benefit from, and that is soap. After you have used those remedies, just take a cake of soap to protect the outside of the udder. Take soft soap and use that on the udder or hard soap and cut up a cake of that into water, dissolve it and let it get cold and thicken, and rub that on the outside of the udder. This protects the udder from the air and has a sort of pressure on the udder. There are a number of things, and if you have a valuable cow to support the udder with a sling of some kind would be highly beneficial. Many times by supporting the udder you give great relief.

Member:—I have heard turpentine and lard recommended. What do you think about that?

Dr. Ryder:—There is a question about turpentine. Everything has been recommended for inflammation of the udder, from blisters down to ointment. What I would recommend is plenty of lard and you can add poke root, that is supposed to have a beneficial action on the glands of the udder. Melt your lard and stir in the extract.

Member:—What proportion of poke root and lard do you recommend?

Mr. Ryder:—Two ounces of fluid extract of poke root to eight ounces of lard. The only trouble is where you use those remedies directly on the glands, they sometimes dry up the

secretion and the cows do not regain normal conditions until another year.

The Chairman:—Any further questions? I am sure we have been highly entertained this afternoon and received some good information. I wish to call your attention to the program for tomorrow. It is important that you visit machinery hall in the morning and see the gentlemen representing the different phases of dairy supplies, talk with them and gain what information you can there. After that we will meet here about 11 o'clock for a business session. I am sure we will enjoy the session in this hall tomorrow afternoon and I hope to see you all at the banquet tonight.

We will now stand adjourned until tomorrow morning at 11o'clock.

Thursday evening, at seven o'clock, three Church societies of Marengo, united in furnishing a banquet for the dairymen, which was an enjoyable feature of the convention. President L. N. Wiggins, presided as toastmaster, after the supper, and among those who responded to toasts, were Messrs. O. C. Gregg, Minnesota; Professor Hart, St. Charles, Ill.; Prof. Van Pelt, Ames, Iowa; Mr. Principal of the High School of Marengo; Mayor Price of Elgin and Jos. Newman of Elgin.

Thursday Morning Session.

Meeting called to order at 11 o'clock by President Wiggins.

The Chairman:—I will appoint at this time the committee on nominations, which committee will consist of

Messrs. Campbell, of Genoa,
Neilson, of Camp Point,
Fredericks, of Elgin.

If you have any nominations for any office, I would suggest that you hand them to this committee.

Our secretary will read the report of the resolution committee, the butter scores and I believe he has the complete report of the milk contest.

We have a question box to open up this morning and while these resolutions are being read and the nominating committee is assembled, if you try and think of some questions to ask one another we will get some information in that way. We have

a very good program this afternoon and while some of the members may have to go home, I hope all will remain as long as possible so as to complete the afternoon program with a good attendance.

I want to thank the members of the membership committee for the energy they have displayed. This association needs the support of every man in the dairy business or butter business in the entire state. The main object of all these meetings is getting together and lending what assistance we can give.

The secretary will now read the resolutions.

The Resolutions.

Whereas, The dairy interests of the country is one of the largest in the agricultural department, and

Whereas, Those interests are now cared for as a division of the bureau of animal industry, and

Whereas, We believe its interests could now be best cared for by a dairy bureau in the agricultural department, therefore be it

Resolved, That we recommend to the secretary of agriculture that he ask congress to make the dairy department under him a bureau by itself, in place of a division in another bureau.

Whereas, The secretary of agriculture has taken great interest in dairying and furnished several of the best instructors to aid both the producer, manufacturer and dealers in dairy products,

Resolved, The thanks of this association be and are hereby respectfully tendered to Secretary Wilson for sending Professors Webster and Lane and Messrs. Credicott and White into this state, to aid those interested in the dairy, to improve the output from Illinois, realizing the importance to the continued advancement of the dairy interests, in the absolute cleanliness of both the products of the dairy, and equally therewith, the sanitary conditions of the stables and dairies where said products are produced, therefore be it

Resolved, That we heartily appreciate the efforts of the United States department of agriculture at Washington in its endeavor to correct, by publicity, the present faulty conditions in some of the dairies of the country; and

Resolved, That we favor the adoption of the score card system as used by the United States department in the examination of stables and dairies in the state, and the publication of a bulletin showing scoring of all plants examined.

Whereas, We notice, in the public press of Chicago, the price of milk in Chicago has been raised to 8c per quart, and

Whereas, They assume this is too high a price to pay for clean, bottled milk, therefore be it

Resolved, That we, the dairy farmers, in annual convention assembled, hereby

Resolve, That, considering the price of feed, help, dairy cows and the extra care demanded, the price to the dairy farmer must be raised to compensate him for his investment and expense.

Resolved, That the thanks of this association be, and are hereby, tendered to the members of the general assembly and senate for the enlarged appropriation, which will allow us to reach more people with the dairy gospel.

Resolved, That the work done at the state fair by this association, in connection with the dairy department of the university, should be continued and premiums given for dairy cattle, milk and cream, as well as for butter and cheese.

Resolved, That the thanks of this association be, and are hereby, tendered to Mr. A. O. Auten for his assistance and hearty support at the state fair and for his interest in dairying and dairymen generally.

Resolved, That we especially thank the ladies of the church societies of Marengo for the banquet served Wednesday evening, Jan. 15, and wish to praise them for their splendid management of this affair and the excellence of the food served and assure them that we regard this banquet as the most pleasing feature of this convention.

Resolved, That the cheese interest of the state should receive more attention and suitable premiums be offered at our meetings, and we would recommend a special meeting of the association be held in the cheese district when the directors shall deem it most convenient and opportune.

Whereas, At all our conventions the dealers in dairy products and supplies have always treated us generously, therefore be it

Resolved, That the thanks of this association be, and hereby are, tendered to all who have helped make this convention a success. We especially thank our old friend Jules Lumbard for coming to us again with his cheerful voice and for the entertainment he has favored us with at much inconvenience to himself.

Whereas, We know that the success of any meeting is due, in a large measure, to the attitude assumed by "the press," and appreciating their universal willingness to assist in giving this meeting widest publicity, therefore be it

Resolved, That the thanks of the association are hereby extended "the press" of the state as a whole, and to papers of Marengo in particular for the loyal and untiring assistance rendered.

Resolved, That our thanks are hereby given to Mayor Patterson for his hearty welcome; to the citizens of Marengo for their generous hospitality; to those who so kindly assisted upon the program by favoring us with readings or music; to Messrs. Gilkerson and Dike for the indefatigable zeal in providing local arrangements.

Whereas, There has been introduced to this congress a bill to change the present oleo law, and

Whereas, As it is necessary to be ever on the alert to guard the dairy interest in this most important particular, therefore be it

Resolved, That we recognize the excellent work accomplished in the past, and being done at the present time, by the National Dairy Union, in looking after legislation to protect the dairy interests of the country, and urge dairymen and creamerymen of the state to give the National Dairy Union personal and financial support.

Resolved, That the hearty thanks and appreciation of the association hereby extended to Lewis N. Wiggins and George Caven as our president and secretary for their zealous work in behalf of our association and of the dairymen of Illinois.

Whereas, The buttermakers of the state have organized and formed an association known as the Illinois Buttermakers' Association,

Resolved, That we extend the help of this association to them and appreciate their meeting with us at this our thirty-fourth annual convention.

Resolved, That we believe it to be to the best interest of the dairy industry to work together.

Note—The matter of uniting the two associations was left to the directors of the dairymen's association and a committee from the buttermakers' association.

The Chairman:—You have heard the resolutions. Have you any suggestions or amendments to offer? Mr. Newman have you any suggestion to offer in regard to the buttermakers' resolution?

Mr. John Newman:—I do not see where it is advantageous to maintain two separate organizations.

The Chairman:—The principal feature at present is that the State Dairymen's Association is incorporated under the state law and an appropriation to that association was made by the last legislature to extend two years. We could not get an appropriation for next year if we should change the present name or incorporation. There would have to be a new incorporation formed and the money would not be forthcoming to this association if the name were changed within the next year.

The Secretary:—Possibly it would be better in passing the resolutions, if we leave the matter of joining the two associations to the directors of the Dairymen's Association and the committee appointed by the buttermakers. The question could be settled by the directors and that committee.

The Chairman:—I think that would be the most reasonably solution. At some convenient time they could get together and have a meeting of the full board of directors.

Mr. Newman:—We were under the impression there was to be a meeting this morning.

The Secretary:—That would have been called by the president had all the directors been here, but a majority of them left here this morning. We have not as full a representation of the board of directors as we would like to have.

The Chairman:—I am satisfied there is that disposition to amalgamate.

Mr. Newman:—We have not arranged for election of officers, or anything of that kind and did not intend to but if this thing goes to next Spring the buttermakers will have an organization.

The Secretary:—The meeting of directors will come next month, it cannot be delayed until later than February.

The Chairman:—We might let the resolution stand. It shows that we want to get together and the invitation is extended to the buttermakers. We are all one in interest and all one in unity of feeling and it is, of course, up to you gentlemen what to do, but I would suggest that the officers of the Buttermakers' Ass'n ask their committee to meet with us in Peoria at the round-up meeting of the Farmers' Institute. We can then give it more time, more thought and in the meantime perhaps formulate an idea and get it in better shape when we do meet.

Member:—I understand if the combination of the two associations takes place the buttermakers will have representation on the board of directors of this association?

The Chairman:—Mr. Fredericks is on the nominating committee and I understand they have represented the buttermakers on the proposed directory for this association. They have one man selected to represent the butter interests.

If there is nothing further to be said on this subject, a motion will be in order to adopt the resolutions.

On motion, duly seconded, the resolutions were adopted as read.

The Chairman:—The butter scores will now be read by the secretary.

CREAMERY BUTTER.

Name.	Address.	Score.
Geo. E. Waterman,	Garden Prairie	93½
M. L. Musselman,	Lanark	89
R. A. Wilson,	Rush Creek	92
Otto Meyer,	Leona	92
B. M. Campbell,	Mascoutah	93½
Louis Nielson,	Camp Point	96
D. C. Benton,	Kaneville	93½
Wm Englebrecht,	Thomson, R. No. 1	91
Geo. Bloyer,	Harper	88
Geo. W. Hoppensteadt,	Goodenow	91
F. E. Butler,	Belvidere	92

Name. Address.	Score.
Chris. Larsen, Ontarioville	94
R. J. Koepsell, Round Grove	97
B. A. Fillmer, Port Byron	88
K. B. Carpenter, Thomson	89
A. F. Kreuger, Flora (Clinton Jct. Wis.)	90
S. L. Murphy, Garden Plain	88½
Otis C. Murray, McHenry	90½
Fred J. Weddige,	92
Bobt. Moren, Freeport	91½
Geo. Deardorf, Amboy	93
J. G. Goeller, Tower Hill	88
H. G. Frazen, Golden	88
C. Long, Belvidere	95
Geo. A. Cutler, Belvidere, R. No. 5	93½
E. M. Lamos, Warren	90
Wm. J. Kane, Morrison	89
Geo. Simonson, Urbana	93½
J. W. Rhuby, Mt. Carroll	92
Frank E. Rawson, Greenwood	93
A. J. Salley, Roscoe	92½
A. M. Cooksley, Humeston, Ia	92½

DAIRY BUTTED.

Eli I. Crosies, Utica	92
Chas. Foss, Cedarville	93
A. E. Thompson, Marengo	94
R. H. Pennington, Plainfied	93½
J. F. Deyarmond, Marengo	88
Wm. Pearson, Elgin	86

The Chairman:—Are the members of the nominating committee ready to report, and will the secretary please take the Chair.

Secretary Caven takes the Chair.

REPORT OF NOMINATING COMMITTEE.

Mr. Campbell, Chairman.

Mr. Chairman:—

Your nominating committee begs leave to submit the following names:

President—L. N. Wiggins, Springfield.

Vice President—J. P. Mason, Elgin.

Directors—W. E. Janes, Hinsdale; C. E. Lee, Urbana; M. S. Campbell, Genoa; A. F. Jensen, Effingham; J. F. Sanmann, Havanna, R. R. No. 2.

On motion, duly seconded, report of the nominating committee was adopted as read, and the secretary was instructed to cast the ballot of the association for the nominees, which was done and they were duly declared elected to the offices named.

Mr. Wiggins resumes the Chair.

The Chairman:—The election of the secretary-treasurer of our association is in the hands of the directors. The directors meet next month and appoint the other officers.

Secretary Caven:—The reports of the year cannot be submitted until the expenses of this convention are figured up and regularly audited, and it is also the custom of this association to present that report at the meeting of the directors when the other officers are selected. That report and the other reports are published in the printed report that we get out every year, giving the proceedings of the convention in full and a report of the expenses, and receipts.

We are a little handicapped in getting out our reports in a hurry. The report is always ready to be gotten out immediately but on account of the appropriation from the state, we are not permitted to make a contract for printing our report until the funds to be used for that purpose become available, and they do not become available until the first of July, so we have to wait until that time before we can make a contract and then we get our reports out as soon after that as possible. If it were possible for us to use the appropriation right away, we could get our reports out several months earlier.

The President:—It looks as though you were not going to let me out of this and I appreciate the honor very much. This

makes my third term and I have endeavored to advance the interests of the dairy association and the entire dairy interests of the state. How well I have succeeded I will leave to you but there is this about the situation, we have to work in unity and keep in close touch with the officers of this association and the buttermakers' association throughout the state. We have got to lend earnest support to our pure food commission and make as many suggestions to the dairy department at Urbana as we see fit. They are always glad over there to have suggestions from a layman in the business and I know, so far as they can, they try to follow them out.

The success of this association in the past year and the results we have obtained are due in a large measure to your secretary, Mr. Caven, who has been untiring in his efforts. He promoted a dairy train in the last year, which was successfully operated and run over the Santa Fe system. Every arrangement was carried out to the minutest detail and the train was a great success. We talked to a great many people in the six days we were out.

Mr. Caven made arrangements with the State Fair, though Mr. Auten, Chairman of the Dairy Department, and we were nicely entertained there and had a nice dairy association tent. Mr. Auten promises that we shall have that tent another year and I hope to see every dairyman and buttermaker there. It is rather hard to hold meetings there but it is a place we can get together and call our own.

I wish at this time to thank Professor Lee, of the University, for the interest he has always displayed at the State Fair exhibit, at the experimental and dairy building. We call that little meeting we have there a sort of demonstration of milk testing and buttermaking, and I am satisfied that is one of the most important features of the dairy department of the state fair, and Professor Lee is to be heartily thanked for his co-operation.

The association now has on foot a proposition for another dairy train to be run on some of the Southern lines if possible and I hope by the last of March, at least, you will hear from us with another dairy train. The increased appropriation we received last winter from the legislature was very fortunate as a great many associations were turned down while we have been able to increase our appropriation a thousand dollars a year.

While this is not much, it enables us with careful management to promote a few new things each year and in this way we have three or four meetings instead of one as formerly.

I think that about winds up the business. Mr. Caven have you any further suggestions to make?

Mr. Caven:—No, I have not.

The Chairman:—We are now ready for the question box. There are a couple of questions in writing and we will take them up in order.

QUESTION BOX.

Q. No. 1. What is the relative feeding value of alfalfa hay and wheat bran? That is, if bran is worth $24 per ton, what would be the value of choice alfalfa?

The Chairman:—The first man who will answer that question will start the ball rolling. Mr. Lee can you give us some information on the subject?

Mr. Lee:—I am not supposed to tell one kind of feed from another. I am sure some of the men in this association who have had experience in handling wheat bran and alfalfa can tell more about it than I. It seems the whole thing would depend on how the man was handling his herd, how he was feeding his bran and how he was feeding his alfalfa. It would depend on whether the alfalfa was fed in place of bran with other feed.

In order to get the real value out of the two crops a person will have to have some kind of understanding as to how it was to be handled. No farmer can go to work and feed bran alone as concentrated feed and get its real value, unless he is feeding something else to balance it up. It seems to me on proper feeding, with the two well balanced evenly, that at the present price of bran, or at $24 a ton, and the present price or a price in the neighborhood of $18 or $20 per ton for alfalfa would bring about the same result.

The Chairman:—Perhaps Mr. Foster of Springfield, can give us some further information on that. I know he has had some experience in alfalfa and bran.

Mr. Foster:—Mr. President, this has gone beyond me a little. We are feeding both right now and I do not know the value of one from the other, and I think that is a matter of the contents of the protein and carbohydrates you have to balance your ration, and I believe in feeding both of them together.

While we have not been feeding any bran for nearly a year until the last two weeks, I have been feeding alfalfa all winter, and in feeding a little bran with the alfalfa we are getting better results, but as to the value of each I cannot tell you.

Member:—What other grains were you feeding?

Mr. Foster:—Dried brewers' grains, 1 lb. of oil meal, and silage. Both bran and alfalfa are rich in protein.

Member:—What I could not make out from the question was whether it was intended to have one take the place of the other, or feed them together.

Mr. DeYarmond:—The question was mine. I felt that we had not covered the entire subject, so I put in another question there.

Mr. Foster:—I think if I had to cut either out altogether, I would cut out the bran at present prices.

The Chairman:—That is practically what you are paying at Springfield, $24 a ton, and your alfalfa is costing about $16, you feel if you had to cut out one or the other you would cut out the bran at $24 than the alfalfa at $16 and at the same price you would feed them together.

Mr. Campbell:—I was talking with Dr. Hopkins before I sowed alfalfa and he told me that one ton of the leaves of alfalfa were equivalent to the protein value to a dairy cow of 2,700 lbs. of bran.

The Chairman:—The point Mr. DeYarmond wished to bring out was the practical feeding value and results. You can get at that by a table of digestive nutriments, but I understand the question here is to get down to the practical side of it and to get the experience of men who have been feeding both. I know in our herd at Springfield we have tried to get along without bran when we can buy alfalfa so much cheaper than bran, but, as Mr. Foster says, we have obtained better results by feeding both. Alfalfa is hardly a substitute for bran.

Mr. Gilkerson:—In our feeding experiments last winter for the University, we did not make any extensive experiments in regard to the alfalfa and bran but we had two or three cows who were not in the experiment to make any record on, so we did a little experimenting with them. We tried dropping off bran,

just feeding corn mixed with the alfalfa but we did not get the results that we did while feeding a little bran. I do not know what the result would be of taking the alfalfa meal in place of the bran with the corn meal for the grain ration. I have been on the point of ordering some alfalfa meal within the past week to try that, I would like to try it for our own experimience.

The Chairman:—In what way would alfalfa meal differ from alfalfa hay?

Mr. Gilkerson:—It could be mixed more thoroughly with the grain.

The Chairman:—The cow will consume it, will she not?

Mr. Gilkerson:—She probably would, but I do not like to feed clear corn meal to a cow. I would like something to lighten it up at the same time.

Q. No. 2.—Will a cow assimilate corn meal better if fed bran than if fed alfalfa, or will the latter cause a better assimilation?

The Chairman:—Mr. Gilkerson has answered that question pretty thoroughly. Are there any other questions now?

Mr. Jansen:—Has anybody in the audience had any experience planting cow peas and corn together for silage feed? What has the result been in putting up that kind of silage? The production of an acre could be materially increased by planting those two crops together.

Mr. Campbell:—I think if Mr. Jansen will look back to the report of our Effingham meeting, he will find Judge Lindley spoke on that subject and his experience was that feeding that along in the spring and summer the cows lost their hair.

The Chairman:—They always do that, don't they?

Mr. Campbell:—The hair all come off their hides too fast. It was too strong a food. We tried soij beans in connection with corn and when we got down in the silo to where the soij beans were in connection with the ensilage the cows would not eat it. It had a stronger or more offensive smell or taste and the cows did not take to it as they should, and consequently we were not able to keep our cows up in milk. When we got through with that part of the silage the cows came back to their feed and their milk.

FOR NEXT MEETING.

The Secretary:—Within the past few days I received a letter from the Chicago Association of Commerce asking the Association to meet in Chicago, and then yesterday I received this letter from the secretary of the Elgin Merchants' Association.

Elgin, Ill., January 13th., 1908.

Mr. George Caven, Secretary,
State Dairymen's Association,
Convention Hall, Marengo, Ill.

Dear Sir:—

At a meeting of our Board of Directors this afternoon a resolution was passed that we ask you to favorably consider Elgin as the next Meeting Place of the State Dairymen's Ass'n.

For the purpose of more fully ascertaining just what the requirements for space and entertainment would be for said Convention and to be able to get a general outline of the expense in connection therewith—before a final settlement is reached—the Board of Directors have instructed me to invite you to meet with them at any future date you may select.

Wishing you a profitable and harmonious meeting at Marengo, I remain,

Respectfully yours,
GEORGE A. SMITH, Sec'y.

The Chairman:—That matter will be decided by the Board of Directors after the state fair, but we are always glad to get these letters and requests to meet at different places throughout the year, so as to give them full consideration.

I might say, before I left home I was instructed by the Business Men's Association of Springfield to extend a glad hand for the city of Springfield, and ask this association to meet there next year. I am speeaking now as a citizen from Springfield, not as the president of this asociation, and I feel that city is in about the central part of the state, with easy access from all roads, good train service. We have many meeting halls we could throw open to you and I am satisfied as far as finances go

the citizens will do as well as you can desire. We have not had the association meet in Springfield in its history. We have been North two years and have been South two years, and at any rate I believe we ought, if possible, go down to Springfield next year. However, that is a matter for the directors to take up later on.

QUESTION BOX.

Q. No. 4. Will you give a general plan for a modern barn for a small dairy of from twenty to forty cows?

The Chairman:—That could be answered in a great many ways but if anyone here has a practical barn, working with that number or cows, it might be of interest to give us a brief outline.

Mr. Campbell:—I would suggest that the gentleman take up that matter with the authorities at Washington, D. C. Mr. Lane told me yesterday that the Department of Agriculture will send blue prints of a barn to anybody that asks for them. All that is necessary is to write to the Department at Washington, telling them what you would like, and they will send you a number of different blue prints and plans free of charge, and they are glad to do it. It would be a nice thing for any dairymen who are contemplating building a barn to take advantage of that.

Mr. De Yarmond:—I would suggest that the gentleman find out what we have here in our own state. I understand there is in this state just completed a round barn, that is a model barn, has been built for that purpose, to exhibit a model barn. That is at Urbana.

The Chairman:—Mr. Lee can you tell us about that barn?

Mr. Lee:—That barn has just been completed, the cattle have not been put into it. I cannot give you any specifications as to size, but it is a round barn with a silo in the center, with storage room above, and the cattle in the basement facing the center with places fixed so that the cows can be fastened while eating and afterwards left loose, no stalls. We simply have a central place next to the manger where we can fasten them while they are being fed and milked, after that they are to run loose in this barn.

Mr. De Yarmond:—You consider allowing them to run loose an advantage?

Mr. Lee:—It has not been definitely decided whether it is an advantage or not.

Member:—It seems to me no herd of cattle can run together peaceably.

Mr. Lee:—I think that is true in your herd, and a person should have a herd of nearly the same breed and uniformity, and you will find if the cows have freedom they will do better than if tied up.

We also have an arrangement in this barn so we have place to keep the herd bull and also the tread power, so he will furnish all the necessary power for grinding the feed, running the separator and such things. I would suggest that those that are interested in that style of barn would take advantage of the short course beginning next week and at the same time look over this barn. We have a fine storage capacity and we see no reason why it should not be a satisfactory thing. The objection to letting the cows run loose can be overcome by fixing up the stalls.

Mr. Foster:—What arrangement have you for getting your silage into the silo?

Mr. Lee:—I think the cutter is on the second floor, although I cannot state positively. We drive right into the barn.

Mr. De Yarmond:—Mr. Hayden told me the barn is sixty feet in diameter.

Mr. Campbell:—In connection with round barns, I had quite a little talk with Mr. Lane in regard to barns and he told me they are tearing down round barns all over the country, in Maine and Massachusetts they are tearing round barns down as they are not a success. There is too much waste room in them, it is too hard to get the feed into them, and the old fashioned oblong barn is the barn for you farmers. That is the experience of the authorities at Washington.

Mr. Lee:—Is it not true in a round barn with the same material you can get a good deal more storage capacity.

Mr. Campbell:—I doubt it very much. You have to have two complete circles of cattle or you have a lot of waste room. Two neighbors of mine have a round barn with one circle all around the outside and instead of putting them around the other

way they put a row through. On each side there is a waste of room. Besides that they have to have such a large opening in the door to take the hay in, the barn is extremely cold.

Mr. Lee:—Have they the silo in the center?

Mr. Campbell:—Silos should not be permitted to be put in the barn, they are offensive.

Mr. Lee:—Do you think there would be more silage odor where the silo is in the barn? What objection would there be to building a silo if there is no odor?

Mr. Campbell:—It is impossible to build a silo that will keep the odor out, because we must open the doors to get the feed out. You can keep it out more when the silo is on the outside.

Mr. Lee:—I think that is something no one can speak on definitely. It depends altogether on the man that handles the silage.

Mr. Campbell.—It depends on the man, how careless he is, in having it lying in the barn.

Mr. Lee:—We feel there will be no more odor from the silage with the silo in the center than where the silo is located outside.

Mr. Campbell:—With the average dairy farmer I do not believe it would practical, but the way you keep things the silo in your barn will be more agreeable than 90 out of 100 ordinary dairymen would have it with the silo outside.

Mr. Lee:—We went over the whole plan, figuring the cost of a silo we would have to build separately if we built an oblong barn, and the cost was considerably decreased. The whole thing depends on the man that handles the barn, from the standpoint of feeding silage and also how the barn is arranged so as to reduce the waste room in handling the product in the barn. You can drive right into our barn and back out.

Mr. Campbell:—That can be done in a country where you have a side hill or go to the expense of building a bridge. Mr. Ichner is going to build near me, we are on a level prairie, and if he builds a round barn and economizes on space, he has to go to the expense of building a strong bridge that will carry a pair of horses and two tons behind the horses. There is an expense

to add to this if he closes up the first story. While it might work all right on the hill side he has to work at a disadvantage in being on a level, therefore he has to elevate and that is a hard thing to do.

Mr. Lee:—Do you have to drive into a round barn in order to fill it with hay?

Mr. Campbell:—Yes, or make doors on one side and drive up to the side of it. We have two in our neighborhood but they both have openings right in the center and drive in and pull the hay up from the center.

Mr. Lee:—There are several round barns in the neighborhood of Freeport, and they are fine barns.

Member:—Have they silos in the center?

Mr. Lee:—I do not think they have.

The Chairman:—It is a good deal of everyone to his own liking about these round barns and square barns and oblong barns.

Are there any further questions? If not, we will stand adjourned until 1:30 this afternoon.

Thursday Afternoon Session.

Meeting called to order at 1:30 p. m. Mr. Campbell in the chair.

The Chairman:—We will open our program with a paper by Mr. Chase, of Harvard.

RESULTS OF THE TESTS OF HERDS IN THE VICINITY OF MARENGO.

Mr. Frank H. Chase, Harvard.

Mr. President, Ladies and Gentlemen:—

If I should stand up here and read off long tiresome lists of how many pounds of milk or butter fat "Bess or Queen or Rose" gave, I would hardly merit your attention. The results of the

tests which I have been carrying on for the past few months are mainly in figures, yet I have profited very much by certain experiences in testing cows and various peculiarities which often arise. For these reasons I shall briefly tell you about my plan of testing and of some of the things that have come within my notice during the past year.

When Secretary Caven wrote me last September about testing a few herds for this report, I decided to use records of our own herd, which we have been testing for nearly nine months, those from a neighbor's herd, which was tested for about six months and to test three or four other herds. I tried to borrow a few milk scales for the farmers but managed to get only one.

Then I formed a small milk-testing association of three farmers, each one weighing his milk every third week and saving composite samples every sixth week. I calculated the number of pounds of milk by multiplying the week's weight by three, one weight for the week preceding, one during and the other following the week during which the milk was weighed. Although I advise weighing the milk continuously and testing about once in nine weeks, I consider the former plan a good one, especially when several wish to test at a minimum of expense. The farmers took up this work with no hesitation as they considered this a very good chance for testing their cows, first, because this test covered only about three months and meant little work on their part,, and second, because as I furnished the scales and sample bottles and did the testing, it cost them nothing outside of a little time weighing the milk and taking samples.

It has been my observation among many that milk testing is a matter of mere getting started. I can now recall two instances where as many farmers knew that the scales and Babcock test were the only means of improving their herds and were in every way in favor of them, but for some unknown reasons neglected to purchase outfits. After a couple of years they got milk testing machines and went on with weighing and testing without any dissatisfaction. Both farmers, however, acknowledged that their hesitancy was due to pure negligence.

Now just a few words about dairy conditions in this vicinity as I have found them and particularly as to the light they cast upon the results as revealed by the test. There is a popular sentiment among the dairymen with whose herds I am best acquainted in favor of the dual purpose cow. And this very belief is probably the most potent factor in the making of the low dairy records I have found. Of the six herds that I tested only two of them were composed of strictly dairy cows, grade Holstein. These two herds, however, represented the smallest ones in point of number of cows. Three of the other herds were principally Durham, while the sixth was about one-half Red Polled and one-half Polled Durham. But I do not want to give the impression that Durhams are worthless, but rather that if you wish to find high milk or butter fat records you must search outside the ranks of dual purpose cow, nor did I mean that these records are so low as to render all the cows profitless but that they are not comparable with fancy records which all of you have heard about. As a matter of fact I think that these records are as good as could be expected when we justly consider the conditions under which they were made.

I could not give a complete report upon the dairy conditions that I have found without speaking of irregular milking hours. Perhaps this subject is somewhat foreign to my topic, but as I have had a very good opportunity of observing this point of dairying I shall tell you of my conclusion in the matter if you will pardon me for a moment. Irregularity in milking has a larger influence upon milk production than many are aware of. The cow that is milked irregularly becomes anxious and restless waiting for the milking hour, and again is made uneasy by being milked too soon. One need but observe the weekly milk sheets in order to know about the milking time. I have heard the argument (and you all have) that if a cow is milked unusually early at one time she will make up her small mess by a larger one at the next milking, so that for a week she would give as much as the regularly milked cow, other conditions being considered equal. This reasoning I have found not to hold good for a week. I am glad to say, however, that the herds I tested were milked with reasonable regularity. Here are the weights of two different cows' milk taken for one week, fourteen milkings, which fairly represent regular and irregular milking hours:

Regular, J. Neiss, No. 5.		Irregular, H. A. Chase, No. 12.	
5.2	5.3	14.9	18.4
5.6	5.7	19.3	13.7
5.5	5	13.7	18.7
5.5	5.3	17.9	15.5
5.4	5.3	12.9	21.1
5.8	5.5	21.1	16.2
5.5	5.3	11.7	13.4

Farmers will admit that this past fall was a poor one for obtaining best results from cows. The effect of soft corn was particularly noticeable and the shortage of other grains made matters worse. Some who would have bought grain restrained themselves on account of the high feed prices. These conditions all contributed to low records and therefore we must make a just allowance for normal conditions.

High Butter Fat Averages—H. C. Well's Blue No. 16.

She averaged 6:08 pounds butter fat per week for 23 weeks. Also averaged 7.42 pounds for 9 weeks.

H. A. Chase, No. 6.

Averaged 6.23 pounds per week for 18 weeks. This is fairly good when we consider that this was made during her second year of milk.

H. A. Chase, No. 12, 8.33 pounds for 14 weeks.

H. A. Chase, No. 12, 9.48 pounds for 5 weeks.

G. A. Gay, No. 5, 9.23 pounds for 6 weeks.

Same cow gave an average of 8.33 pounds butter fat for 12 weeks.

High Butter Fat Averages. H. C. Wells' Blue, No. 16.

H. A. Chase, No. 6.

High Tests.

H. A. Chase, No. 7, July 27, 6.3.

J. E. Wells, No. 3, Oct. 26, 7.5.

The test made by Mr. Wells' cow is the highest that I ever tested. This fact may seem more noticeable when I saw that she was a grade Holstein.

Low Tests.

G. A. Gay, No. 10, Dec. 21, 2.9.

High Weekly Average.

H. C. Wells' Tucker, No. 10, averaged 19.1 pounds milk per day for 162 days.

H. C. Wells' Blue, No. 16, averaged 23.5 pounds milk per day for 162 days.

Large Weekly Milk Records.

G. A. Gay, No. 5, Oct. 26, 245.6 pounds.

G. A. Gay, No. 10, Nov. 16, 243.2 pounds.

This was made during the third week of lactation.

H. A. Chase, No. 12, July 27, '07, 245.3 pounds.

Made during tenth week of lactation.

F. C. Wells' Blue, No. 16, 261.

Blue averaged for this week 37.2 pounds of milk per day.

Large Daily Milk Records—Two Milkings.

G. A. Gay, No. 10, Nov. 18, 37.9 lbs., 3rd week lactation.

H. A. Chase, No. 12, July 23, 38.7 lbs., 9th week lactation.

Single Milkings.

G. A. Gay, No. 10, Nov. 19, 21.5 lbs.

H. A. Chase, No. 12, June 3, 21.1 lbs.

H. A. Chase, No. 12, July 23, 21.5 lbs.

H. A. Chase, No. 12, Aug. 1, 22 lbs.

DISCUSSION.

The Chairman:—If you have any questions now is the time to ask them as Mr. Chase has had experience along this line.

Mr. Van Pelt:—Did you find the cows with most good blood in them tested the highest?

Mr. Chase:—Yes, ordinarily. This one herd of Holsteins tested the highest but I do not think that was due to blood so much as because they were nearly dry. The first test we made of that herd averaged 5.88 and that is pretty good for a Holstein. I am not prepared to say which held the poorest score throughout but I believe the Red Poll tested the best.

Mr. De Yarmond:—How much milk did the Red Polls give?

Mr. Chase:—That depended on whether they were good or bad cows, some gave 245 lbs. once in a while. That is about as high as any of the cows have tested good. It is not a question of breeds so much as their individual work.

Member:—What was the cause of one cow testing higher, then going low and coming back?

Mr. Chase:—There are occurrences like sickness and, for instance, the cow that had a sore teat. She dropped from 3.6 to 2.9, and I believe it was entirely due to that.

Member:—You referred to one young cow.

Mr. Chase:—Yes, I remember that and I believe she was dry during part of the test. This cow tested high at the beginning, then dropped to 3 when she was fresh, but I have known cows to test the highest when they were fresh. I will give you an example of that. Cow No. 12 I tested when she was fresh, just took a sample and tested it and it tested 4.8; a composit sample for a week tested 4.2; nine weeks later she tested 3.4; nine weeks later 3.25, and then she raised to 3.4, and she was practically dry at the time she made the lowest test.

Member:—Did these tests agree with the Babcock test?

Mr. Chase:—Yes, they were made by the Babcock test.

Member:—Our creamery tests every day and pay according to the Babcock test. They assert that a cow testing 5 will remain so and that it is impossible to change that test by feed. I would like to have your opinion on the subject.

Mr. Chase:—I did not try to carry on any tests in relation to feeding. That was something I could not very well do because this test took up all of my time and besides it would have taken more personal observation than I could afford to give, but I do not think the feed does have much effect upon the test. It may vary a little but the test is in the cow, in my opinion, and remains so.

Member:—Your opinion is that you can increase quantity by feed but not quality?

Mr. Chase:—I would like to hear from anybody else on that.

Member:—What did you say in regard to the Durham cow?

Mr. Chase:—The Durhams constituted a great part of the herds I tested, there were about thirty or forty of these and twenty of the other breeds, and I believe the Durhams did as well as any. They did better than the Holsteins, taking everything into consideration, although I do not know much about the Holsteins. As I said, they were freshening and going dry at that time and it is hard to get any estimate in so short a time. I did not want to give the impression that the Durhams are worthless but I want to say that their records are not comparable with fancy records which we have seen.

The Chairman:—We have with us this afternoon a gentleman who will tell us about cow testing associations, Mr. Helmer Rabild, Inspector of the Dairy and Food Commission of Michigan. Mr. Rabild has had a great deal of experience in this matter and will give us a good deal of information on the subject.

CO-OPERATIVE COW TESTING ASSOCIATIONS.

January 20, 1908.

Ladies and Gentlemen, Members of the Illinois State Dairymen's Association:—

When Mr. Lillie asked me to come to this convention to fill, not his place, but his appointment, I confess that I felt somehow unhappy. It seemed to me that I would be committing a fraud upon you. Many of you know Mr. Lillie, perhaps personally and have had opportunity to listen to his open and plain explanations of the problems and the technicalities of the dairy business, and have come here expecting to hear him again. However, he left me no choice in the matter. He is now busily engaged as a representative from his county in revising the constitution of the state. The constitution is fifty years old, and the state has been growing so rapidly during these fifty years that it has outgrown its constitution and people felt that it had to be broadened out to fit the new conditions.

I cannot deliver the address Mr. Lillie would have delivered, only a supplement to it. The dairy business calls for a great deal of technical knowledge, more so than any other system of farming. A dairyman must first be a successful farmer. He must know how to grow maximum crops and how to harvest and preserve these crops properly, and in addition to this, he must

know how to get the most out of them. There is where additional knowledge is required of a dairyman as compared with any other branch of agriculture. There is more technical knowledge required to be a good dairyman than is required of a business man in town. Dairying is a business, and if we expect to get the most out of it, we must put business principles back of it. The dairyman is a manufacturer. He takes the raw material grown upon his farm, and which has a certain market value, feeds it to his cows, and produces a marketable product-milk.

A successful manufacturer must have his business founded on certain business principles. One of these is that the price at which he sells the article he manufactures must bear a certain relation to the cost of manufacture. It must provide for a profit, for he has capital invested and he has a factory to keep in repair. For instance, a manufacturer of shoes if you please, who gets an order for a lot of shoes at the fixed price of $3.00 a pair, knows that the cost of manufacture must be less than $3.00 if he makes any profit. He will go to work and try to reduce the cost by buying his raw material cheaper if he can, or try to make shoes out the same raw material, he will put in better machinery, or labor saving machinery and keep a check on all leaks and wastes in the factory and use every effort to produce his shoes as cheaply as possible.

The same principles hold true in successful dairying. If we expect to make any money out of dairying, we must produce a pound of butter or one hundred pounds of milk for less money than we sell it for. That is the practical side of dairying.

Much has been said about sentiment and dairying, and it has been truly said. Sentiment is the very foundation of dairying. Milk is produced by the cow, not for the purpose of enriching the dairyman, but for the purpose of nourishing her young. Man is simply taking advantage of the all powerful impulse of motherhood, and he is doing it for financial gain, and I wish to speak about that side of it, the practical, financial side of dairying.

I repeat, the dairyman is a manufacturer, but do we dairymen know how much it costs us to produce a hundred pounds of milk or a pound of butter? I confess I am not familiar with your dairy business here in Illinois, but during the last few years I have been in touch with dairying in Michigan, and have had

opportunity to investigate its status, and my experience leads me to believe that only a few dairymen do know the cost of producing one hundred pounds of milk.

I started to gather statistics on this point a couple of years ago, but did not succeed in getting much data. I went to one of our oldest and best creameries and selected promiscuously from their books the names of fifteen of their patrons and from the records at the creamery I figured out how much money each of these fifteen men had received from their dairy products in a year. Then I hired a livery and drove out to see these fifteen men to learn how many cows they had kept during that year, and also if possible, the cost of keeping these cows. This is what I found: The gross receipts from the creamery in one case amounted to $25.00 per cow in a year, and the majority ranged in the neighborhood of $20.00, but when it came to knowing how much it cost them to keep a cow in a year, or how much it cost them to produce a hundred pounds of milk, I could get no data whatever. While these cases may be exceptional in regard to profit, I think I am right when I say that only a small proportion of our dairymen know the cost of production of milk. It would not be difficult to figure out how much it costs a dairyman to keep a whole herd for a year, and since the advent of the Babcock Tester, it is not difficult to find out how much butter fat the cows produce in a year. A farmer should test his cows occasionally, but this has been advocated for a number of years through the Agricultural Press and from the Institute platform, and yet how many farmers do it? A number I know have purchased Babcock Testers, and used them once or twice and then put them to one side. They planned to test their cows right along regularly, but when the day came for testing there was something else required their attention and they put the testing off and finally forgot all about it. One day they stubbed their toes over the Babcock Tester and told the Hired Man to take it up in the garret, and there it stays. And it is not because it would not pay to use them, but I think it is because a farmer's life is so independent that he does not have to. There is no one to look after him, and he is responsible to no one for how he conducts his business.

I have some experience on this point and I am going to confess it to you. Some years ago I was put in charge of a

large dairy, numbering several hundred cows. No records of the individual performance was kept and I, who came directly from a farm, with a membership in a cow testing association was eager to institute a system of records. I spoke to the owner about it and explained the advantage of it, and he agreed with me and told me to go ahead. He went to live in the city during the winter and the management of the herd was left entirely to me. There was much work to do, and in the course of a few weeks I gradually settled down to routine work and had all but forgotten about the system of weighing and testing that I had proposed to the owner, when I received a letter from him inquiring how that particular part of the work was coming on. I got ashamed of myself and began at once to weigh and test each cow's milk and keep a record of the individual performance, and when the owner came in the spring we went over the records together and finally decided that it would be a good business proposition to dispose of a number of cows whose yield had been exceptionally poor. And we began discriminating between the calves we raised and selected only those from the best cows as members of the future herd.

This would probably never had happened had there not been something or someone to get me started. When a man gets past school age he needs strong incentives to incite to mental activity and to change methods to which he has been accustomed. He requires some outside force or influence to develop enthusiasm for his work. There is not much in the every day life of a dairyman to inspire enthusiasm, at any rate, getting up at four o'clock in the morning and going out in the stables to milk ten or fifteen ordinary cows is not going to inspire much enthusiasm for dairying. But if those same cows are of a kind which give a handsome profit every month in the year, then it is a different proposition, and we become more interested. It does not cost any more, and it does not take any more work to care for good cows than it does to keep and care for poor ones, and we can have good cows if we inaugurate this system of testing and put into practice the lessons it teaches us.

It is almost out of the question for the average farmer to buy good dairy cows. Such are not very often found in the market, and then only at very high prices. A man who has a cow that nets him $75.00 to $100.00 a year is not going to dispose of

her for a song. It is too good an investment for him. The average farmer will find that if he wants good dairy cows he will have to raise them himself, and he can do it in comparatively a short time if he will adopt the plan and stick to it.

I believe that one reason why we have not made more progress in dairying is that we do not follow it up long enough. We start in on dairying, but by and by some other system appeals to us, and we switch over on to that. We don't have to stay by one single thing for we can make a living in so many different ways on a farm. With us up in Michigan, when a business dairyman has been in the business for some years he gets the idea that he can make more money off from fruits and make it easier, and he sells out his cows just at a time when he begins to get his work systematized. We shift around too much.

Like the Dane with the Irish name, we want to go into the dairy business to stay in. The best method the dairy man adopts is to secure a good sire with dairy qualities to head his herd, and then raise the calves from the most profitable cows and with them replace the cows that have proved unprofitable, but in order to do this he must be able to tell the good cows from the poor ones, and it cannot be done in any other way than by testing them and weighing their milk.

I received my first lesson in dairying from my father, who had a dairy herd of eighty thoroughbred Holstein cows. He used to tell me that the cows horns had to curve just so if she was a profitable dairy cow, or the tail had to reach down below the hock joint, otherwise, she would not give milk enough, and things of that sort. Since the advent of the Babcock Tester, we know that the external appearance of a cow does not always tell her worth as a dairy cow. It is an old saying that you cannot tell by the looks of a toad how far she can jump. Just so with the dairy cow. You cannot tell by the looks of her whether she will give you four or eight thousand pounds of milk a year.

The dairyman must know three things about every individual in his herd, first, how much milk she will give, not in a week or a month, but in a year, because he must feed her a year. Second, he must know the richness of the milk in order to determine its market value. Third, he must know how much it costs to keep the cow a year. This is an important factor. He must

know the cost of production for it is the net profit which makes a cow valuable.

He must put into operation on his farm a system which will enable him to know these three factors about every cow in the herd. I know of no system which will do this as cheaply and as efficiently as a co-operative cow testing association. Of these they have a number in the old country, Denmark has over four hundred, Sweden about five hundred, and Norway about 180 and Germany and Finland have a number. I will explain first the practical workings of the association.

A few farmers in their community owning a sufficient number of cows organize themselves into an association, elect officers and hire a man to do the testing. The expense is to be paid pro-rata by each man in proportion to the number of cows he owns. It is desirable to have sufficient number of cows in the association so that the expense will not exceed $1.00 to $1.50 per cow a year. This man visits one herd a day. He arrives in the afternoon, sees the cow's milk and takes a sample from it for testing, estimates the feed and the cost and puts all this data down on a record blank, which he leaves with the farmer. This performance he repeats the next morning and that day the farmer takes him and his outfit to the next farmer, and so on. He gets to each farm once a month and at the end of the year he figures up the yield of milk and butter fat, the value of the same, the cost of feed to maintain each cow a year; figures out the profit or loss on each individual in the herd and furnishes every patron with a complete record. And all this at an expense of from $1.00 to $1.50 per cow a year.

We can put it this way. Suppose a man comes to your farm today and says that for $1.00 per cow he will tell you just exactly how many pounds of milk each cow gives, how much butter fat she gives, what it costs to keep her and what the net profit is from each cow per year. Wouldn't you think it a business proposition to accept this offer, and that is just what a co-operative cow testing association offers to every man.

There is another factor in this system, which we should not lose sight of. We know that this man comes to our farm once a month and looks over our business, and it is natural for us to want this business to give as good an impression as possible, and we are going to show a little more interest in our own business,

and perhaps get enthusiastic over it if we have good cows. At any rate, it is going to stimulate us to better work, and that is just what a great many of us need. Just a little stimulus once in awhile to keep us keyed up and to keep our enthusiasm fed.

I made a trip to Europe this summer for the purpose of investigating what the co-operative associations had done in the Old World, and wish to give you a few of the figures, both for individual herds, and for the country as a whole. On the farm I spoke of a few moments ago this regular system of testing and reading has resulted in an increase of the net profits of over 100 per cent during a period of nine years.

Another herd owned by August Knick, Beltaberga, Sweden, increased from 7,320 pounds of milk per cow in seven years to 11,333 pounds, an increase of 4,013 pounds per cow. The herd consisted of 71 cows and figuring the butter at 22 2-10 cents a pound it means that Mr. Kinck the seventh year received $2,558.00 more from his herd than he did before he began testing. In ten years this amounts to $25,588.

Take the little country of Denmark for instance, which has an area of about quarter that of————. During the last 20 years the number of cows in that country has been very constant. In 1887 they had a little less than a million cows, but in the same period the production of butter per cow has increased from 120 pounds of butter to over 200 pounds. This amounts to over 18 million pounds of butter a year and this has all been accomplished through this system of testing the cows. Practically speaking, they have changed their cows from being more or less a beef animal into dairy cows. I do not mean to say that all cows in Denmark are in cow testing associations, in fact, only 15 per cent of them are, but even those herd owners not members of associations derive benefits from this system indirectly by intercourse with their neighbor's who are members.

Two years ago it was my good fortune to be able to organize a first Co-operative Testing Association on this side of the ocean. This was copied after those in the old country. I have in this bulletin a record of the first year's work. I will give you just items for your consideration. Here is one herd consisting of nineteen cows, where the net profit is only $8.64 per cow in a year, and here is one where the net profit is $36.12 per cow.

Here is one herd where there is a difference between the net profits from the best and poorest cow of $52.00 a year. These two cows put side by side and from the external appearance we were unable to say which one was the best dairy cow. Several of these cows show a loss for the year, one as high as $11.00, and a great many of these who indicated that they were unprofitable, were sold as soon as this fact was suspected.

I have figured the cost of producing 100 pounds of milk with some of these cows. Take this first herd for instance, the best cow produced milk at the cost of 60 cents a hundred, while the poorest one charged its owner $1.85 per 100 pounds. In the next herd the best cow charged 41 cents per 100, and the poorest one required $2.15 worth of feed to produce 100 pounds of milk. In figuring the cost of production we have paid attention to only the amount of feed consumed. We have figured that the calf, the skim milk and the manure pay for the labor in taking care of the cow.

Going back to the records I find here a herd of nineteen cows. The best cow charges 42 cents per 100 pounds for milk production, and the poorest one charges $2.20 per 100. In other words, if a man had a herd of cows like the best one of these he would be getting $2.31 for every dollar he expended on them in feed. He could soon pay off the mortgage on his farm and could afford to give his family all the comforts money could buy. While this other cow only returns him 65 cents for every dollar's worth of feed he spends on her. This man knew nothing about these facts when we began testing his cows, in fact, he was rather proud of his cows and thought they were all good ones. It reminds me of a story of the farmer who went to Chicago to see the sights. Before he went his wife admonished him to be very observant and remember all he saw so he could tell her about it when he got back. In the city the farmer saw a boy playing the slot machine. He watched him for a while and began figuring out how he was coming out financially, and he figured that for every nickel the boy put in the machine he received about three cents back. When the farmer came home he told his wife about that blamed fool of a boy who did not know enough to quit, although he only received three cents for every five cents that he expended on the slot machine. But after awhile the same farmer put on his blue jeans and went out to feed his cows,

which only returned him three cents for every nickel's worth of feed he expended on them.

The members of this Association have at all times had the benefit of the Cow Tester's advice, and as he is an expert dairyman, much good has been accomplished in the way of formulating rations, purchasing of feed, etc.

But the effects of the first year's work are much more far reaching. While none of the members owned a Dairy Bull at the beginning of the year, there are now after the Association has existed two years, more than 14 high bred Dairy Bulls owned by the members of the Association. Many of the members have purchased cows of dairy type, and even a Bull Association has been formed. It will take a year or two more before the effects of this better breeding will show itself in the herds, but I am convinced that this Association has benefited its members already to the extent of several thousand dollars, and this is not all, but it has taught the members that there is more to dairying than just hard work, and it has given them interest and enthusiasm for their labors own work and enabled them to let their souls enjoy good in their labors. And that is what makes life worth living. I thank you for your kind attention.

DISCUSSION.

The Chairman:—Now, gentlemen, I would like to have you question our neighbor from across the pond. He is a man that has been with the dairy cows himself. I was somewhat disappointed when I heard that Mr. Lillie was not going to be here to talk to us, but I am glad the man that does the work is here himself, and I want you to get all the information you can from him.

Member:—What is the average number of cows in each association?

Mr. Rabild:—We have to hire a man for each association. If the members pay one dollar per cow per year and hire a man for $300 a year, they have to have three hundred cows. If that man wants $400 a year and his board and lodging, which, by the way, he gets on different farms, they have to have 400 cows or if they only have 200 cows they must pay $2 a cow.

Member:—How many cows in the association to which you referred?

Mr. Rabild:—The first year they only had 290 cows and we got a man from the old country, who had done this work there and was thoroughly posted on it. He was willing to work for small wages the first year until he learned the language, it was good experience for him and of material benefit to us. The rest of the associations have in the neighborhood of 300 cows.

Mr. De Yarmond:—How are these associations started or organized?

Mr. Rabild:—I have organized the associations in Michigan. I get my pay from the state, I am a state dairy and food inspector. I have taken an interest in this work and organize for them when the farmers want it. As soon as they are organized, we call a meeting and I put the business in the hands of the farmers, they own the business from that time on. Through the courtesy of the dairy and food commissioner, we loan them a Babcock tester for a year free, we also furnish them with books and blanks and records which they need in their association.

Mr. Jorgenson:—How many cows could a man take care of in a year, because the more cows in an association the cheaper it would be for each man?

Mr. Rabild:—A man could test forty or fifty cows in a day. We do not find many big herds of forty or fifty cows in Michigan, but if the farms are located close together he can test two herds in one day. A man could test forty or fifty cows a day.

Member:—Most of the people around here keep not less than twenty-five cows. Will you please tell us something about the organization to carry on this business?

Mr. Rabild:—They form this association, elect a president, secretary and treasurer and they have meetings once in a while. I take great pains to see they do have meetings because I know if they get together once in a while and talk over their experience and the quality of their cows, that they are going to get more interested in it. They have a meeting once in a while and talk those things over. At the end of the year they have an annual meeting and elect officers again, I notice there is quite a strife to get in as director. One of these associations has nine directors. The president is supposed to be the manager and have charge of the business end of the association, but the man that goes around among the farmers, tests the cows and stays with them and makes his home with them one day each month, is the

backbone of the association. If he is a good man, if he is a man that will call the attention of the farmers to the little points about cost of production, etc., he is the one that is going to be of the greatest benefit to them, and up in Michigan we have been fortunate in getting good men to take charge of that work.

Mr. Van Pelt:—Don't you find it difficult to get good men at the low salary you pay them?

Mr. Rabild:—Last year about this time we had four associations that wanted men. We had a little difficulty but we did get four good men. We could have organized five or six more associations but we did not want to because we were afraid we could not get good men for them and we did not want them to fail. This year it looks a little better. For one thing, labor is not as scarce this year as it was a year ago; another thing, is I got in touch with the immigration bureau in Washington, that bureau which directs the stream of immigrants to different parts of the state, and I told them if they had any cow testers to spare to send them to Michigan, that we needed them, and we have the promise of two.

Mr. Chase:—Do the farmers weigh their milk all the time?

Mr. Rabild:—The milk is weighed one day every month, morning and evening. That is how I explained they came very close to getting the actual amount of milk that cow gave each year. It does not vary 4 per cent.

The Chairman:—I would like to say that a year ago, at our annual Directors' meeting, this thing was talked of among the directors, and we offered to any of the students that took the short course at Urbana and passed a creditable examination in the dairy department to give a certificate which would allow them to go among the farmers and test cows for such organizations as that, but I am sorry to say no one took advantage of that offer; and I will say, in behalf of the directors, that we extend that offer again this year. If any of the boys around Marengo go in and take the short course next Monday, if they pass a suitable examination, this association will give them a certificate entitling them to test cows for their neighbors, and we will assist in the organization of a test association anywhere in Illinois if a sufficient number of farmers will request it. We tried to start them this past season and hoped to arouse enough interest to start at least one. I would like to see that thing taken hold of. I have tested my

herd for three consecutive years, did not miss weighing a milking in those three years, and I appreciate and realize the value of this work.

We will now have an address on "Work Along Dairy Lines" by Mr. H. E. Schuknecht, Assist. Dairy and Food Commissioner of Illinois. Mr. Schuknecht has had a good deal of experience in the last few years looking into the milk produced in towns around here and quite a number of people in the state of Illinois turn pale when Mr. Schuknecht steps up and asks for a glass of milk. I have the pleasure in introducing to you Asst. Dairy and Food Commissioner, Mr. Schuknecht.

WORK AMONG DAIRY LINES.

Hon. H. E. Schuknecht, Assistant Dairy and Food Commissioner, Chicago.

Mr. Chairman, Ladies and Gentlemen:—

I feel that I should apologize for appearing here at all this afternoon because I have had no opportunity to prepare an address. You will escape very fortunately because I find it very convenient to have an attack of Grip just before the Dairyman's meeting. I do not enjoy the Grip very much but between the Grip and the address I do not know which I would choose, but, nevertheless, I shall try to give you a brief summary of the conditions in the food commissioner's office as they exist now and a comparison with how we found them a year and eight months ago.

You may not be aware of the fact that until 1906 never in the history of the state had there been anything like a concerted effort on the part of any state department to look into and regulate the condition of the milk supply of the various cities in the state. It is true that some few of the cities did some work on their own account, such as Chicago and a very few others. In 1906 we were not able to do much work as we would like to have done but we did sufficient to uncover a great many very unpleas-

ant things in the supply of milk, chief among which were poisonous adulterants used as preservatives and unsanitary conditions on the part of those bringing milk into various cities throughout the state.

In 1906, out of a total of about 1,100 samples of milk collected from the city milk supply in cities throughout the state, we found seventy-five containing poisonous adulterants. How many were below a standard then in force in the state I will not attempt to say because the standard fixed at that time was so peculiarly worded and drafted that it would not have amounted to anything to have tried to enforce any kind of standard. The law established a standard and provided no penalties for violation of it, so we might as well not have had the law.

The work this year was continued along very much the same line and about an equal number of cities were visited in the neighborhood of forty. I am very glad to say that while we did not collect quite so many samples this year as we did last, yet approximately eight hundred were collected from about the same source as last year, and the total number of samples with poisonous adulterants were only thirty against seventy-five last year. The percentage figures about 5½ last year as against ¼ of 1 per cent this year. Now I do not know just how much that means to the dairymen, but to me it is certainly a very gratifying thing and I believe it must be to the dairymen, because I do not think you will find any stronger competition than the barnyard pump and the poisonous adulterents used for preservatives. Every time you try to put a clean, good, wholesome product up against these two factors the odds are very large indeed and it is a situation that should not obtain in so enlightened a community as Illinois and we propose to see to it that it does not obtain again. So much for the poisonous preservative.

We turned our attention this year to another phase of milk adulteration in the city supply, and I have mentioned it before,—it is the barnyard pump. If I had been a stranger in the state and dropped in here and someone told me that about 3 per cent or a little more of the milk samples collected from the city milk supply had been watered or deliberately skimmed, I would not have believed it. I had not thought it was a possible condition but, after all, human nature is very much alike most everywhere, or as David Harum would say, "There are about as much human

nature in some folks as others, and maybe more." It looks as though it were very much a question of opportunity with some people whether they work the pump or not. Now we do not propose to permit that any longer. Our method is to call the dairyman in and ask him to explain (under the law we are obliged to do that) how it is his cows gave that amount of water on that particular day, and we find that about 80 per cent of those called in will admit that their horse ran away that day, that there was a rain storm, or that the can tipped over in the trough that particular morning. While we have been pretty lenient with them, it has been mutually agreed, sometimes the agreement being bolstered up by a small deposit with the Justice of the Peace, and so on, that the tanks should be fixed so the cans cannot tip over in the future,—and the tanks are being fixed.

Then outside of our city milk supply we find another very interesting thing, and that is the farmer selling milk to creameries, cheese factories, bottling plants and various places of that kind. We do not pretend as a rule to pay quite as close attention to this phase of the business, but nevertheless it is something that should be looked after because I see no good reason why abuses should be condoned in that particular field any more than they are elsewhere. The revelations that we found in that particular phase of the milk supply were very interesting. Out of a total of 2,400 samples examined, the inspector picked up and brought in to the office 300 in which he used a lactometer, and these samples were brought in because they were suspicious looking. Out of the 300 brought in, about 75 or 78 proved to be either skimmed or watered.

It is not easy to believe that state of affairs would exist in the state of Illinois today, gentlemen, but it did. It did exist or figures do not count for anything. Figures and science must be thrown to the winds or those figures must stand as facts because they are on our records and are there to stay. Now there is competition of the kind that you gentlemen who are producing a good, clean, honest product never figured on having when you entered the business, and you should not be asked to compete with such conditions. These factors are things that you cannot figure with the honest dairy cow, the cow was not built for that purpose, and you are not going to overcome them of your own accord very easily but we are going to help you. We are doing

all we can to put a stop to that sort of thing. I was raised in the dairy business, my heart is with the dairymen and it hurts me to see a dairyman come in and admit that he did those things, did them for fraud, that they were not all accidents. I have been very lenient in my recommendations as to the dealing with those men but I have given them to understand invariably that the time is coming and very soon when those acts can only be settled in the office of the Justice of the Peace with hard cold money.

I have every sympathy in the world with the man who milks the cow and trys to get all he can out of her. I was milking cows myself before I was big enough to carry the mess away from the cow when I got through milking and I know exactly what it means, and I tell you gentlemen that as long as I am public officer I will not tolerate any of those things any longer than I have to, and the man that practices those must be pretty careful that he does not cross swords with our office too hard, because he will get hurt.

There are some of the things, gentlemen, which we have been trying to do in the way of helping you who are trying to do an honest business with the honest cow. They are only part of them. Perhaps the greatest progress, aside from weeding out the poisonous preservatives as a protection to our little ones, who are depending on the greatest food of all, pure milk, for a living, our greatest progress has been in trying to do away with a competitor of yours, viz., the product that masquerades under the name of butter but which is not butter,—oleomargarine.

It is my business in the office to have charge of all the work done in the department relating to dairy products or any other class of foods, and I know whereof I speak when I say that all of the other elements of fraud with which we come in contact in the office will not amount to more than 10 per cent of the fraud taking place in the sale of oleomargarine as and for butter in the state of Illinois alone. Ten years ago there was enacted in this state a law known as the Oleomargarine law, a law preventing the coloring of oleomargarine so as to resemble yellow, June butter. Political conditions at that time were such that the manufacturers of the fraud were stronger politically than they are now. Times have changed and are still changing and are

getting better for the dairymen, in that particular at least. During the first ten years that law was enacted quite a number of efforts were made to enforce it. The department, however, was never able to win a single case in Court against a dealer for selling colored oleomargarine. The law on which we depended for protection had been declared unconstitutional by three judges in Chicago. Cases of disagreement with juries, etc., had become so numerous that the department had become discouraged and for a number of years nothing was done.

When I entered the department, I looked the matter up, had a few consultations about the law with certain lawyers, and satisfied myself that the law was good and I determined to test that law a little further and see if we could not make it hold. We brought forty cases against as many dealers in Chicago for the unlawful sale of oleomargarine. The cases were brought last January, about a year ago. The counsel for the opposing side secured various stays until finally in April we came to trial with one of the cases. Our attorney and the state's attorney had been taunted a good deal about coming into court with a dead horse, that the law was no good and they would knock it out in a hurry. Well a jury was selected in the city of Chicago and they convicted that man for keeping colored oleomargarine for sale, and such a crest fallen lot as those fellows around that court room that day I certainly never beheld before and I do not think I will again because they are not going to allow themselves to be so disappointed in the future. However, we won the case, the first case under a law at that time ten years old. The court upheld the law, the jury convicted the defendant, and there was nothing more to be done except pay the fine and carry the case to the Supreme Court to test the constitutionality of the law, which they agreed to do. Under condition that they carry the case up in good faith, as is customary in court practice, comparatively little activity was shown by our office for a while, pending a settlement of the issue in the Supreme Court. We found, however, that they never intended to carry it to the Supreme Court, they had no notion of testing that law and they let it be known themselves a little while afterwards by saying, "Guess we will not carry that law up because if the law was knocked out you would only get one that would hold." I told them I thought that was right and they might as well save trouble and

expense by paying their fines, and I suppose all the fines were settled last month.

That marks the beginning of a successful attack on the oleomargarine interests in the state and I feel now that I do not care whether they carry it up to the Supreme Court or not, they will either carry it up or pay fines and quit. They must do one or the other. They will have to put up with prosecution if they do not carry it up.

That may not appeal to some of you gentlemen who are milking for market milk supply but I want to say that it has just about as important a bearing on your business as it would have if you were in the business of producing milk for the making of butter, because every pound of oleomargarine that you get out of the way makes room for a pound of butter, and every pound of butter makes room for that much more milk, and there you are. It is a wheel within a wheel, every part of this dairy business is connected with some other part of it.

These are some of the burdens we are trying to take off you, the burdens of unscrupulous competition that you have suffered from time immemorial, because I believe I speak the truth when I say that only within the last two years has anything that had the semblance of a concerted effort been made by any state department to try to correct some of the evils of vicious, unfair, unscrupulous competition under which the dairymen have suffered all these years.

These things out of the way, we are laying the foundation for better things. You cannot expect to gain all your profits from protection, you must do something on your own responsibility, and this gentleman from Michigan has touched on and talked about the one most important of all things at the present time before the dairymen. He put it aptly and truthfully when he said to you that you are in a manufacturing business. It does not make any difference how much money you get for your product, if it costs you more than you get you are a loser. There never was a man owned a manufacturing business who did not produce the product that he sold for less than he sold it for, and if he was a successful man he knew what it cost him, how much less than he was getting for it. If he did not know this he was not successful, he had to know it to make a success of his business and I want to just say here that I am thoroughly convinced that

the dairymen of the future will be compelled to know their raw material costs before they can intelligently place a price on it and have any idea as to whether he is getting a profit or not.

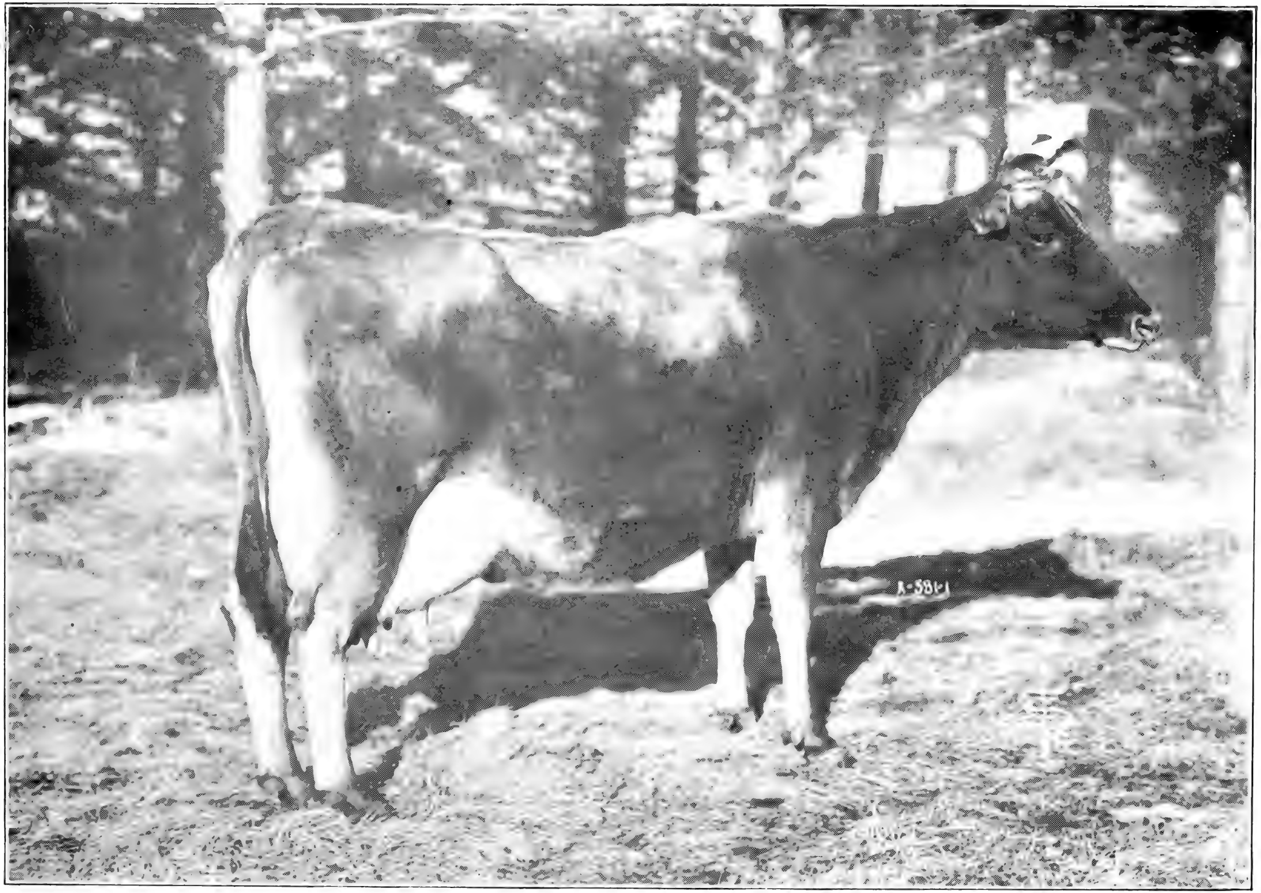
It is not enough that we take the town pump, poisonous preservatives and oleomargarine away from you as competitors, it is your place now to find out if you cannot produce your product for less money and I know it can be produced for less money; the statistics anywhere available in this or any other country show that and the men gathering these statistics have not done it for fun, they have gotten at the good hard facts, and the best of these hard facts have been laid before you this afternoon. I listened here to what I consider the most interesting, the most instructive and the most valuable discussion of the simple, practical way of getting at the cost of dairy products. Take these things home, mull them over and make up your minds that there are enough of you here to form such an association. It only takes twenty-five to thirty of such dairies as you have, and I don't know of any place better fitted to set the people of Illinois an example of what can be done in fiinding out the cost and placing the dairy business on an intelligent basis, than this community right here. I hope you will take that matter up and act on it, and while I will not say that I can lend you much assistance through our office still I think I can, and I want to urge you to get together and talk this matter over. Take it up with the Dairymen's Association, take it up with the Dairy and Food Department, and I believe we can get at least one good association started. If we cannot do anything else, we will steal this fellow from Michigan a little while and if he will not be stolen I will go over and borrow him. Now we have to get this thing going because I know it is the right thing to do and that is why we ought to do it. Do not talk about wanting more money for your milk, make it from the other end. It does not make any difference what you get for it if it costs you more to produce it, then you are a loser. Produce it for less money.

There are a good many other things that could be said, but before closing I want to again refer to oleomargarine. We had great difficulty, as I explained, in having that law upheld. The hotbed of that business is in Chicago. Chicago is the hardest place in the world in which to reach the public, especially on this subject. There are several reasons for this and perhaps one may

be found in our own office, we may not know how to go at it; the other reason is because the oleomargarine interest is so large in Chicago that our daily papers are in one of two positions, either they have a very tender spot for the business or they are so crowded for room that anything with great big poison scare-head lines on has no room in their papers, so we find it difficult to reach the public through the papers unless we stir up something in the way of excitement which is usually not warranted by facts because our work can usually be done in a quiet manner. We published a bulletin however, Bulletin No. 6, entitled Fraud in the Sale of Oleomargarine. Before writing the bulletin, I wondered whether it was going to do us much good. I felt that only a small part of the press would take it up and publish it anyway. I am glad to say, however, without wishing to advertise anybody's wares, that in this fight the Chicago Tribune has been thoroughly fearless. They published that part of the bulletin that was to guard the interest of the housewives and consumers. It is the only paper published in the city of Chicago that comes out in an absolutely fearless manner against that or any other fraud that we may happen to discuss.

The problem that then presented itself was to get this bulletin before the people. I considered the matter and thought the fraud warranted the writing up and exposing it in such a way that it would at least appeal to those engaged in the business of selling frauds, so I wrote the bulletin. After it was finished I took it to the offices of the State and City Grocers and Butchers Associations, as I thought if I could enlist their help I would come closer to the consuming public than I could in any other avenue opened in the city. We had ordered thirty thousand bulletins published and in these bulletins we showed up in detail the methods employed by the fradulent peddler in selling oleomargarine. I will read from the bulletin a paragraph to show what his methods are:

This bulletin is especially intended to check the fradulent peddlers, canvassers and dealers by calling the attention of the public to them and to the methods employed by them in defrauding the public out of millions of dollars by selling *Oleomargarine* for, and at the price of, pure butter. The method employed by these peddlers and canvassers is substantially as follows: they tell the housewife that they can sell her good butter cheaper than



the legitimate dealers can, for the reason that they get their butter direct from some creamery or dairy, as for instance a creamery or dairy at "Eau Clair, Michigan" or some place in Wisconsin or Iowa, and in that manner save the consumer a good many profits of middlemen, etc. By their offering to deliver butter a few cents cheaper than the market price for good butter, the unsuspecting housewife places an order for butter to be delivered either at once or in a few days. Then either the same canvasser, but usually some one else representing him or the same firm, delivers the goods excepting only that as a fitting climax to the tissue of falsehoods and misrepresentations used by the canvasser in getting the order, he delivers oleomargarine instead of butter and gets from 25 cents to 30 cents per pound for it while the retail price of oleomargarine, sold lawfully, is from 15 cents to 18 cents per pound. Thus the good housewife has been doubly imposed upon in the transaction; first she has received oleomargarine when she had expected butter, and second: she has paid at least 10 cents more for every pound purchased than she need to have paid had she purchased the oleomargarine from a legitimate or law-abiding dealer.

A casual examination of the wrapper in which the substance is delivered will disclose no marks by which it might be identified, but by an exceedingly careful examination it will be found that a fair percentage of the wrappers are marked "oleomargarine" in letters about ⅜ of an inch in height (instead of ¾ as required by law) and in the dimmest possible manner. The ink used is generally about the same color as the wrapping paper, and usually the paper is purposely wet where stamped so that the stamp can be seen only when the paper has dried and then but dimly, the whole purpose being that the purchaser shall not discover the mark at all.

I took that bulletin to the officers of the Grocers' Association and they asked me how many we could spare. I said, "I will spare you any part of thirty thousand." They called for fifteen thousand at once and it is with a great deal of satisfaction that I received this letter the other day, showing that I was right in my judgment in trying to enlist their help. It is a very powerful organization, organized in every city in the state, particularly in Chicago. The letter is dated January 11th, and reads:

"At the last regular meeting of the Chicago Grocers and Butchers' Association, held Wednesday evening, January 8, 1908, in Masonic Temple, a resolution was unanimously carried endorsing Bulletin No. 6, entitled, "Fraud in the Sale of Oleomargarine." We also commend the able work along this line by yourself and your co-workers." That help comes from a source where we least expected it. They have taken these bulletins and will distribute them in their baskets, and I tell you it takes more than a moment's thought to appreciate what an assistance this Grocers' and Butchers' Association will be to the dairymen of Illinois. This is not all being done for the dairymen but it reverts back to the dairymen and I am proud of those fellows, proud of the help they are giving us.

So along these lines we are doing all that we can and we are going to keep on. The only difference will be that we are going to double our force in the Dairy and Food Department and I really hope to report greater progress next year than any of the past two years. I thank you for your attention.

DISCUSSION.

The Chairman:—If there is anything about this pure food law that you are not acquainted with, I think we have a pretty good man here to explain it. Mr. Schuknecht will answer any questions and he knows how to answer pretty nearly all of them now. I would like to hear from any of you who desire to get any further information on this subject.

Member:—Referring to the milk in which you found the water, was this milk direct from the farmer or from the dealer?

Mr. Schuknecht:—The inspector took it from the wagons of the farmers at the bottling plants, etc. Referring to the samples they came from a total of 2,500 taken at creameries, cheese factories, bottling plants, etc. The other samples came from milk dealers' wagons but come in the list of city milk supply samples.

Member:—I am a shipper myself so I am interested.

Mr. Schuknecht:—Some of the remarks made by the various gentlemen, who were summoned into the office for a preliminary hearing before any suit was brought, as provided in section 40 of the law, are very funny. Some are not so funny, more pathetic, perhaps. One gentleman came in, who seemed to be

fairly prosperous, and he was a little the worse for wear. He had not been in Chicago many times and he got looking over the edge a little too deep soon after he got there. His was such a flagrant case there was no question about it so he came up to the office and I said, "How did the water get in?" And he replied, "Well I will tell you fellows, I put it in there, but I did not think I was breaking any law, I thought I was breaking the creamery man." In another case a sample was taken on a very cold morning in November and the milk was frozen a little. We sent for the owner and he came to the office. He was a jolly looking fellow and I said, "Well, Uncle, how did the water get in?" "O, you want to know how I ice my milk? You know it was pretty cold and we poured the rinse water from one can to another and before we got to the last can it froze and I said, 'What's the use of throwing it out, it will cool the milk,' and I strained it in." Another fellow in the retail business, selling off the wagon, came to the office and I said, "Well, Colonel, a little hard luck to have to come so far to Chicago, what have you been doing out there, how did the water get in, was it raining that night?" "No, it was not raining. I had quite a little trouble with my milk souring so in the morning when I started I put a chunk of ice in every can. I thought that would fix it." Another fellow, a farmer, said, "I heard the neighbors say the best way to drive animal heat out of milk was to put two or three quarts of cold water in each can, and my milk did not sour as quickly when I did that." These are some of the funny things that happen but if these things had not all come out I never would have believed that so much fraud was being practiced in the state of Illinois, but as I said before, the figures are there to speak for themselves so why should we not believe them.

The Chairman:—Have you found any samples of milk among the farmers containing formaldehyde?

Mr. Schuknecht:—No, I never have, it is always in the city milk supply.

Member:—They have every can sealed now and have only tested milk as it comes in right in the car. There is an inspector there who takes the farmers' samples.

Mr. Schuknecht:—We do that but our help is so limited that we cannot get at very much of it. If the dairymen of Illinois ever have concerted action enough so we can get eight or ten in-

spectors working on the state department that can be brought about, then we can go at this work in a much more systematic manner. In this relation our state is too large for the limited force allowed, and this is particularly true for the reason that Illinois is particularly a raw product consuming state, so it requires many more men here to do the same work than in other states, where the milk is manufactured into a finished product. The channel is entirely different and it requires much more and constant looking after.

Member:—We are called manufacturers, but I think at the same time we are laborers as there is a great deal of hard labor in producing milk.

Mr. Schuknecht:—Any manufacturer is a pretty good hard laborer if he makes a success of his work.

The Chairman:—If there are no other questions our secretary would like to make an announcement.

The Secretary:—We had expected to be able to announce the results of the milk test but were not able to do it because the bacteria examination was made by a man from the Wisconsin University who said he hoped to be able to telegraph us the results this morning, but he has not done so yet so I am afraid we will have to make the announcement through letters to the exhibitors, or publish the highest exhibitor in the test in the papers, particularly in the Marengo papers, but we will probably not be able to do that for some days. Another year we will know more about conducting a milk test. The milk really should have come in here three days before the convention, should have been examined then and the test would then be ready when the convention assembled and the other examination could have been made at that time, but this year our bacterial work was done too late to get it in for this meeting.

QUESTIONS ABOUT FEEDS.

The Chairman:—Has anybody any questions to bring out here this afternoon?

Mr. De Yarmond:—I would like to hear from Professor Van Pelt, of Iowa, on the subject of the relative value of bran and alfalfa.

Pro. Van Pelt:—By the charts yesterday I noticed Prof. Hayden brought out the value of leguminous plants, such as

alfalfa, clover, soij beans, etc., quite plainly, showing there was a distinct value over what there was in timothy hay, corn stover, etc.

To show you more clearly that there is more value in alfalfa than in Clover hay, I will say that most of the feeds we buy to balance up our corn are for the sake of the protein they contain and, as I said before, protein is a stimulator of milk production and a product of which milk is largely made up. Bran contains 12.2 per cent digestible protein, that is 12.2 lbs. digestible protein in every 100 lbs. of bran; alfalfa hay contains 11 lbs. per hundred, so you see there are only 1-.2 per cent more protein in bran than in alfalfa, so that it compares very favorably, very favorably indeed. Bran has a distinct advantage besides the protein it contains because it is a laxative and keeps the bowels in a loose condition, and very likely alfalfa does not contain that power to the same degree. Another thing, bran is palatable and is very light, and in feeding with the grain ration it lightens the ration up, makes it palatable.

I had this problem come to me forcibly when I was feeding cows at the St. Louis exposition. We fed there for economical results. All feed stuffs were quoted at a certain specified price, —bran $18 per ton, alfalfa hay $7.50 per ton. It was quoted to all of us at the same price so as to have a basis to work from. Taking into consideration the fact that alfalfa hay was so nearly like bran, I made up my mind if there was any way to get that alfalfa into palatable form to feed with grain ration and take the place of bran, we would be saved the diffference between $18 and $7.50 per ton, so we ran it through a cutting machine and reduced it to quarter inch lengths. At every feeding time we took two pounds of alfalfa hay, put it in the bottom of a galvanized bucket, then weighed up a grain ration and put it on top of that, spread it over and then inserted a steam jet, and turned on a small amount of steam for about twenty seconds, enough to make the stems soft and the grain adhere to the stems. When we fed the cow she ate the grain and alfalfa together, and I am satisfied that every pound of alfalfa the cows ate in that form was more palatable than 2 lbs. of bran and we got great results out of it. I will tell you why I think it was better than bran; we were feeding those cows freely as high as 16 or 18

lbs. of grain a day and the aroma that came from that alfalfa hay during the process of steaming was so sweet that the cows would go up to the feed and bawl for more, showing it was extremely palatable.

There is another thing to take into consideration. You know a horse does not chew his cud, but a cow does. When the horse eats his grain he chews it, masticates and mixes it with saliva while he is first eating it, while when the cow starts to eat her feed she eats it readily, swallows it and it goes into her first stomach; then she lies down and brings it back to her mouth, and begins the process of mastication, then the saliva flows freely and mixes with the food. That saliva has the power of changing carbohydrates and starches into sugar. Corn meal or heavy food the cow consumes but she finds it impossible to get it all back to masticate it, so the process of digestion does not take place thoroughly and a large portion passes without being digested. Another thing, suppose you take two water glasses, you put in one glass corn meal and in another glass corn meal mixed with cut hay. In both glasses pour the same amount of water, allow them to stand a few moments, then pour them out. In this glass with corn meal you will find some in the center dry, in the other glass you will find every particle of that mixture is moist. That brings out my point; this heavy corn meal, if fed by itself, comes in contact with the digestive juices and those juices simply work on the mass; in the other case, where you mix hay with your feed or bulky feeds those juices come in contact with the mass and percolate through it and work on every particle of it. I know you men will find it to your advantage to try that instead of buying so much feed simply for the sake of supplying bulk. Take your ensilage cutter and run whatever hay you feed through a portion of it, mix it with your grain, and you will find your cows will digest the larger portion of the feed. The digestive apparatus of a dairy cow is the hardest worked portion of her whole body and is the first part of that cow that gives away under pressure, so everything you can do to lighten up that cow's digestive apparatus is going to help her make milk.

Regarding the comparative value of bran and alfalfa, I would say that where the alfalfa is fed with the grain, spread out and some warm water thrown over it, you will get equal results to bran and the comparative value would be a difference

between 11 per cent and 12.2 per cent. Does that answer the question?

In view of the fact that bran is very expensive this year I cannot afford to use it in my operations out there. I keep bran to make bran mashes for cows that are off their feed or sick, but I find bran at $25 a ton too high to feed.

The Chairman:—What is your experience with feeding Ajax flakes?

Mr. Van Pelt:—I had good experience except that some cows will not take to them kindly at first. You must start with a small amount and increase it gradually. Ajax flakes have lots of protein and lots of bulk, I think about 33 per cent protein.

The Chairman:—Is that not the cheapest food in the market today?

Mr. Van Pelt:—It is hard to say without knowing the price of other feed.

Member:—How much cottonseed meal can a man feed?

Mr. Van Pelt:—Not over two pounds a day.

Member:—How is it best to feed salt, in the ground feed?

Mr. Van Pelt:—I do that but guard myself and not allow the cow to get too much salt.

Member:—What do you consider the proper amount?

Mr. Van Pelt:—Different cows differ. I put a little salt in the food to aid palatability, then allow them to have salt in the box and get what they desire. I believe it is good policy to mix enough salt with the feed to make it palatable and then let the cow judge for herself.

Member:—Will distillers grain ever taint the milk??

Mr. Van Pelt:—I think not. This question of tainting milk is very exaggerated and I think facts will bear me out in saying that it is not what a cow eats that will taint her milk, but what she does not eat and leaves laying around in the barn. You know milk when cooling takes up odors very rapidly.

Mr. Jorgenson:—Can a man feed strong enough to taint the milk?

Mr. Van Pelt:—He could do that with any milk, but by using judgment I do not think a man could feed heavy enough to taint it.

THE PROCESS OF MAKING CHEESE.

By J. R. Biddulph, Providence, Ill.

To make good cheese, clean, sweet milk is the first essential for unclean or sour milk makes a very poor cheese, in fact it is almost impossible to make anything that will sell for cheese.

The first thing in the morning is to get ready to receive the milk from the patrons as they drive up to the intake, and set their cans on this platform, where there is a platform scale and the weighing can.

The cheesemaker takes off the covers, examines the milk, then empties it into the can where it is weighed and run through a conductor to the vat. When all the patrons have come that he expects that morning, he turns on the steam and the milk is heated to 86 degrees Fahrenheit. While that is going on, he takes the slate and finds the amount of milk received, to know how much color and rennet to use. Then the coloring and rennet are added to the milk and stirred for a short time after which it is left for twenty or thirty minutes to coagulate.

Then take the perpendicular curd knife and cut it lengthwise, then crosswise, then with the horizontal knife cut it lengthwise and this leaves it in cubes. Stir gently for a short time before the steam is applied and continue stirring until it reaches 98 degrees after which it is stirred occasionally until it is thoroughly scalded, which takes from two to three hours.

When it begins to show a little acid, draw off the whey. Then if we work on the granular system, dip the curds into a curd sink to drain stirring until it is cooled. Next it is salted. The rule for salting being 2½ lbs. to one thousand pounds of milk.

When the salt is thoroughly stirred into the curd, it is then ready for the hoops and put to press for a short time or until we get the vat and other things washed.

Then the cheese is taken out of the hoops and the bandage straightened, for when it is put on with a bandage it isn't smooth Now put it in the hoops and press again where it is left till next morning.

The next day they are taken out of the press and placed on the shelves of the curing room where they must be greased, rubbed well and turned every morning.

The question might be asked, how long does it take for it to cure or ripen? That depends on a person's taste as there is a great difference, some liking a cheese about ten days old, while some others would want it to cure sixty days or longer.

I will say the Dairy papers ought to say more about cheese making as it certainly is a part of dairying. I think they would be surprised to hear some of the questions asked by visitors to a cheese factory. One is, "What do you put in the milk to sour it?" They think when the rennet is put in and the milk coagulates that it is sour but that is not the case.

I had a patron at one time tell me, when I told him his milk was a little sour, that didn't make any difference as I had to sour it to make cheese. But I'm sure he would not care for the kind of cheese that his sour milk would make.

This is the process when the milk is in a perfect condition but when one has all kinds to handle they must use judgment.

The Chairman:—I believe this closes our program for this afternoon and also closes the convention for this year. We thank you all for the kindness and courtesy you have shown us and we will now stand adjourned.

MILK AND CREAM CONTEST.

One of the features of the Illinois State Dairy Association meeting, this year, was a milk and cream contest. As this was the first one held by the association it was not expected that there would be a large number of entries.

There were six lots of *Milk* and two of *Cream* which competed for the cash prizes and several dairymen expressed their regret that they did not enter the contest and said they would be on hand next year. What was lacking in numbers, however, was made up in enthusiasm as the keenest was shown in the scoring demonstration conducted by C. B. Lane, assistant chief, United States Dairy Division.

Tests were made in the presence of the dairymen for flavor, acidity, dirt, fats and solids. Petri dishes were shown containing colonies of bacteria and the method of counting them was explained.

The milk and cream exhibited was generally of good quality. The flavor was good, the composition in all cases was perfect, and the acidity normal. There was some dirt found in three of the eight samples but the dairymen on being shown this stated very positively that it would never happen again. The bacteria counts in the milk ranged from 3,000 to 40,000 per cubic centimeter, and in the cream from 30,000 to 50,000, plus.

These contests are particularly valuable to dairymen in that they point out defects if there are any and show where improvement in the quality of the product can be made in various ways.

The 1st prize for Milk was awarded to J. F. Deyerwood, Marengo.

The 2nd prize for Milk was awarded to A. E. Thompson, Marengo.

The 3rd prize for Milk was awarded to L. E. Coleman, Belvidere.

The 4th prize for Milk was awarded to J. F. Sanmann, Havana.

The 1st prize for Cream was awarded to A. E. Thompson, Marengo.

The 2nd prize for Cream was awarded to L. E. Coleman, Belvidere.

The following table gives the score in detail:

COMPOSITION, CONDITION AND SCORE OF MARKET MILK

No.	NAME	PLACE	Fat	Solids not fat	Acid-ity	Total Bacteria per cent.	Pkg.	SCORE FOR Flav'r	Com-posite	Bac-teria	Acid-ity	Pkg.	Total
			%	%	%	Score 20		49	25	20	5	10	
1	J. F. DeYarmond	Marengo, Ill.	4.0	8.81	.18	9,000	Clean	35	25	20	5	10	1st 95
2	C. T. Gilgerson	Marengo, Ill.	4.0	8.81	.18	13,000	Dirt	34	25	19	5	8	91
3 3	A. E. Thompson	Marengo, Ill.	4.5	8.92	.18	30,000	Clean	36.5	25	18	5	10	2nd 94½
4 4	L. E. Coleman	Belvidere, Ill.	5.0	9.02	.18	40,000	Clean	36	25	18	5	10	3rd 94
5	J. F. Sanmann	Havana, Ill.	5.2	9.31	.20	3,000	Dirt	34.5	25	20	5	9	4th 93½
6 6	J. A. Morse	Woodstock, Ill.	5.2	9.31	.20	40,000	Dirt	34.5	25	18	5	9	91¼

COMPOSITION, CONDITION AND SCORE OF MARKET CREAM

10	A. E. Thompson	Marengo, Ill	24	.22		30,000	Clean	36	25	18	5	10	1st 94
11	L. E. Colemen	Belvidere, Ill.	30	.20		50,000	Clean	36	25	17	5	10	2nd 93

The entry blank and score card used were the same provided by the United States Department of Agriculture as follows:

Dairy meeting and milk and cream contest Marengo, Ill., January 14-15-16 under the direction of the Illinois State Dairymen's Association.

OFFICIAL ENTRY BLANK.
Class 1.—Market Milk (Raw.)

P. O. Address................ Date...........1908.

George Caven, Sec.,
154 Lake Street,
Chicago, Ill.

Please enter for me six quarts of milk to compete for prizes offered by the Illinois State Dairymen's Association in accordance with the conditions herein prescribed.

(Signed)....................

Rules: (1) Exhibitors are allowed to make only one entry in each class. This must include in Class 1 six quarts of milk in bottles (quarts or pints).

I, ... hereby certify that the milk entered in this competition is a fair sample of the product sold by me, that it is free from preservatives and that it has not been pasteurized or sterilized.

(Signed) ....

(Proprietor) ....

SCORE CARD FOR MARKET MILK

Exhibitor ....

Address ....

NUMERICAL SCORE

Flavor of	Composition 25	Bacteria 20	Acidity 5	Appearance of package and contents, 10	Perfect score, 100
					Judge's score

DESCRIPTIVE SCORE

Flavor	Composition.	Bacteria.	Acidity	Package and contents.
Excellent. Good. Fair. Bad. .... Flat. Bitter. Weedy. Garlic. Silage. Manure. Smothered. Other taints.	Perfect. Fat...per cent. Solids not fat ... per cent.	Perfect. Total .... Liquefiers.....	Perfect. ....per cent	Perfect. Foreign matter Metal parts. Unattractive.

Remarks ....

....

Date ....

(*Signature*) ....

Judge.

How to Compete.

Milk to compete for prizes must be sent by express or otherwise from station nearest the producer direct to George Caven, Sec., Marengo, Ill.

The package should be plainly addressed on outside; a card should also be tacked on box inside, giving plainly sender's name and address, so as to avoid mistakes in identifying packages.

In order that the milk entered by the exhibitors may be of the same age when scored, it is hereby specified, that it shall be drawn from the cow and shipped January 11th, by express or otherwise as soon thereafter as possible and must reach Marengo by January 13th.

A representative of the association will be on hand to take charge of the milk on its arrival and will see that it is properly cared for.

Questions to Be Answered by Exhibitors.

1. Give date and hour when this milk was drawn from the cow ....

2. Give place, date and hour at which this milk was delivered to the express company or otherwise shipped..............

3. Does this milk fairly represent the average product of your herd in quality and cleanliness? ....

4. How was the milk treated from the time it was drawn from the cow until shipped? ....

5. Do you wish to compete for the dairy-farm prize? ....

Remarks: ....

DIRECTIONS FOR SCORING.

Flavor.

If rich, clean, and pleasant flavor and odor, score perfect (40). Deduct for objectionable flavors and odors according to conditions found.

Composition.

If 4 per cent fat or above and 8.5 per cent solids not fat or above, score perfect (25). Deduct 1 point for each one-fourth per cent fat below 4 and 1 point for each one-fourth per cent solids not fat below 8.5.

Bacteria.

Less than 10,000 per cubic centimeter	20 (perfect.)
Over 10,000 and less than 25,000 per cubic centimeter	19
Over 25,000 and less than 50,000 per cubic centimeter	18
Over 50,000 and less than 75,000 per cubic centimeter	17
Over 75,000 and less than 100,000 per cubic centimeter	16

Deduct 1 point for each 25,000 above 100,000.

When an unusually large number of liquefying bacteria are present, further deduction should be made according to conditions found.

Acidity.

If 0.2 per cent or below, score perfect (5). Deduct 1 point for each 0.01 per cent above 0.2 per cent. (If Mann's test is used, discontinue adding indicator on first appearance of pink color.)

Appearance of Package and Contents.

If package is clean, free from metal parts, and no foreign matter can be detected in the contents, score perfect (10). Make deductions according to conditions found.

FACTS GATHERED FROM THE TEST.

By C. B. Lane, Assistant Chief Dairy Division, Bureau of Animal Industry, United States Department of Agriculture.

The dairymen of Illinois are to be congratulated on this exhibit of milk and cream. It is particularly creditable for the reason that it is your first contest.

I believe these milk contests are going to have a great influence in the future in the production of cleaner and better milk

Friendly competition is a great stimulant and by putting your product alongside of the other fellow's you learn much that you never knew before and whether you find that your product is better than his or whether you find it is not as good, you learn a lesson just the same. In the one case you learn that you are practising right methods and in the other your faults are made evident and you find out where you need to improve. I have watched this movement with much interest since the national contest in Chicago, in February, 1906.

Besides your State, New Hampshire, Ohio, Pennsylvania and Massachusetts have held contests; also the city of Cleveland. It is with much pleasure, therefore, that I have the privilege of being with you at your first contest, to taste the good milk and cream which you have on exhibition.

Some of the milk scored 95, and one sample of cream 94. You would have to travel a long way in our cities to find such milk and cream for sale—in fact certified milk rarely reaches this score. I was in a dining car on a Chicago train the other day and noticed on the menu, milk 15 cents per bottle (one-third of a quart) which you see would amount to 45 cents a quart. secured a bottle of this milk (which was certified) and found it of excellent quality but no better than some of yours. The thing that impressed me was the possibility of securing a price for milk equal to 45 cents a quart, or $1.80 a gallon. If some of your good dairymen could get your product before the public in as attractive form as this dairyman, using bottles of special size and type, you would stand just as good a chance to sell it. While the milk was good, I believe the style of package helped as much to sell the product as the quality of the milk.

Scoring Milk. With higher ideals of food products and a better knowledge of their composition has come more careful methods of judging them. The commercial value of milk and cream, for example, has until recently been rated by the City boards of health and by the milk dealer on the basis of fats and solids they contained. If they reached a certain standard in respect to these qualities and contained no preservatives, no questions were asked. Now we are beginning to go further in this matter and to consider the sanitary condition of these products and standards are being established for bacteria, for foreign matter, for pus cells, temperature, etc. In other words, cleanliness is considered a commercial quality. Naturally the consumer should be most interested in these standards for judging milk, but he is quite helpless in any attempt he may make to bring about improvements, as considerable time is required to make efficient tests and simple appliances are lacking.

We will now take up the method used in scoring the milk in this contest: *Flavor.* You will notice on the score-card that flavor is the first point to be considered. The most points (40) are given to this, for the reason that it is considered the most important. Unpalatable milk or cream is, practically, of no value as an article of food; on the other hand, if these products contain a low percentage of fat or an excessive number of bacteria and still have a good flavor, they may be utilized and in fact a good deal of milk and cream of this character is used. Hence it is apparent that *flavor* is of the first importance. This is also recognized in butter and cheese, where flavor is usually given 45 points out of 100. Clean milk possesses little flavor or odor. If well supplied with fat, however, it may be described as rich, clean, sweet and pleasant. Slight contamination can often be detected more readily by the sense of smell than by taste. Flavors of the cow stable, silage feeds, soaps, etc., are often met with in milk.

The milk exhibited in this contest scored well in flavor. Odors of the cow stable could be detected in a few samples, but on the whole the flavor was generally good. The best sample scored 36½ points out of a possible 40, and the poorest 34.

Composition. Under this head is included the percentage of fat and solids not fat. Fortunately these two things are quite easily determined in the laboratory by the Babcock Test and Lac-

tometer. It is important that milk shall be of good average composition—say 4.0 per cent fat. Further than this the consumer is but little interested. In case milk is used for making butter or cheese, however, the fat content is of great importance, as its value for the manufacture of these products is dependent upon the amount of fat contained in it. If market milk contains 4 per cent of fat and 3½ per cent solids not fat, we consider it perfect in scoring. While this standard is somewhat higher than the State standards for milk it gives a little encouragement to the dairyman who is making an effort to serve his customers with a good quality of milk. All of the samples scored perfect or 25 points on *composition.*

Bacteria. The number of bacteria in milk serves as an indicator—that is, if the number is high, we are safe in inferring that the milk has either been produced and handled under insanitary conditions, or else it has not been properly cooled, or is too old. If the number of bacteria runs up to a million or more to the cubic centimeter of milk (15 drops) it becomes dangerous as a food and may cause sickness, particularly when given to children. Many dairymen do not realize the importance of keeping the cow clean, the stables free from cobwebs, dust and flies and the utensils sterilized. One fly may add a million bacteria to milk, a cow hair may add 26,000 and a piece of hay, 150,000 more. The small top milk pail often prevents millions of bacteria from getting into the milk, particularly in a dirty stable. Feeding dry fodder just before milking has been shown in some experiments to add 6,000 bacteria to a cubic centimeter of milk. Unclean utensils, bad water, and a hundred other things contribute to the bacterial count. Prompt and efficient cooling also is important in keeping the bacterial count low. Milk kept at 50 degrees F. for 24 hours may contain only 89,000 bacteria to the cubic centimeter, while the same milk kept at 70 degrees F. may contain 4,000,000. In scoring, therefore, we take the number of bacteria into consideration and allow 20 points if the number does not exceed 10,000 to the cubic centimeter. However, if the number only reaches 100,000 we consider it of fair quality. If above 500,000 nothing is allowed. I congratulate the dairymen entering this exhibit on the low bacterial content. There were no samples that exceeded 100,000, and two were below 10,000. Four samples would have passed for certified milk in New York

city. The highest score for bacteria was 20 out of a possible 20 points and the lowest score was 18.

Acidity. 5 points are allowed for acidity or sourness if it does not exceed .2 per cent. All of the samples were found to be perfect in this respect.

Appearance. The package containing milk should be clean, free from metal parts, and should have no visible foreign matter. If tin tops or other metal parts are permanently attached to the bottles, they are difficult to clean and can hardly be considered sanitary. If dirt is found in the bottom of the bottle such as particles of manure, hair, bedding, etc., it is an indication that the milk is produced under dirty conditions. Boards of Health are now making more of a point of this matter and are imposing fines for dirty milk, as well as adulterated milk. Until recently a man who put a little water in his milk was heavily fined, while the dairyman who had filthy, disease-producing milk, which was infinitely more dangerous to health, went scot free. 3 out of the 6 samples scored perfect in this respect. I would like to make it clear, however, that even if the dairyman succeeds in straining out coarse particles that may get into the milk, this does not remedy the trouble entirely, for the reason that the milk has already become contaminated and cannot be cleaned again. Probably nine-tenths of the bacteria have passed into the milk by dissolving, and the bad flavor is still there even though the coarse particles have been removed by the strainer. Market cream is scored on a basis similar to that of market milk.

All of the above conditions have been considered in detail in scoring your products and the ratings have been given on the score-cards which you will find with your exhibits. It may be of interest to note that the highest score for milk was 95, the lowest 91, and the average 93¼. The highest cream score was 94, the lowest 93, and the average 93½.

As to lessons from the milk contest, or perhaps I had better say value of milk contests they are helpful to the producer in that they point out to him very clearly the exact conditions of his product, and show him where he can improve. They present an object lesson which is not easily forgotten. They are of value from an educational standpoint and the dairyman comes to understand the importance and significance of improved methods of handling milk—hence a contest may be the means of starting him

on the road to success. I believe these contests will tend to promote a more kindly feeling between the dairymen and health officers. This was certainly true in Cleveland, Ohio, where on the inauguration of the inspection division of the board of health considerable opposition developed among the dairymen, but with thorough understanding of the object of the inspection which was set forth at the dairy meeting held in connection with the milk contest, this opposition has ceased and inspection is sought and welcomed. The most cordial relations now exist between the dairymen and the inspection department. I am told that milk contest and the dairy farm contest held in connection with it definitely contributed to this spirit. This is further shown in a letter directed to the board of health and signed by eleven representative dairymen which is as follows:

We milk producers:

Who ship milk to the city of Cleveland, desiring to make and ship milk of good quality and to observe the sanitary regulations as prescribed by your honorable body, respectfully ask that each and every person shipping milk to the city of Cleveland be required to take out a permit, to be issued by your honorable body, revocable at your pleasure. That said permits shall be classified as 1 or 2. That dairies which score 50 points or above, be classified as No. 1 and all dairies which score below 50 points be classified as No. 2. That all milk dealers, shippers, and pedlers, who sell milk in the city of Cleveland be required to apprise their customers by placard, or otherwise, at all times, of the class of milk that they are offering for sale, and in case of failure so to do, or in case of said milk dealer, shipper or pedler offering for sale milk shipped into the city of Cleveland without a permit, said milk dealer, shipper or pedler's license shall be forfeited.

Austin Herrick,	H. E. Post,
W. A. Mills,	G. W. Adams,
H. F. Bicker,	W. H. Chambers,
S. H. Mizer,	A. F. Dreaher,
C. H. Bennett,	C. E. Riley,
E. Bowen.	

This, eo me, is a very encouraging sign for cleaner milk in the future, when dairymen take the initiative themselves and pledge themselves to observe the sanitary regulations prescribed

by the board of health. The trouble has been that the board of health have not met the dairyman half way in the past. They have gone after him with a club, when they should have first offered suggestions, assistance and encouragement. Then if he did not get busy they should apply the law. Many dairymen do not understand why it is that methods which have been accepted for the past twenty-five years are suddenly condemned. They want an explanation and they are entitled to it. But I believe that when the dairyman understands the importance of greater cleanliness and that cow manure was never intended to go with milk any more than with water, bread, or any food substance, and that it is a poison, he is ready to make improvements.

Up to the present time there has been but little incentive to the production of high-class milk, with possibly the exception of certified milk. Clean and dirty milk have sold for the same price and in direct competition with each other. This is not right. With other commodities the grade determines the price. It should be so with milk.

There are indications, however, that the dairyman who produces clean milk will in the future receive a premium for his product and the careful inspection of the dairy farm and the milk produced is going to help bring this about. Already an advanced price is being offered by the milk dealers in some of our cities for milk from high-scoring daries. This certainly is encouraging to the dairyman who is trying to produce a clean product. Every farm should be inspected, and such inspection should be welcomed by every intelligent dairyman. A score such as that given in this contest showing the milk to be of high quality will have a tendency to increase the sales and inspire confidence. It will be for the dairyman's interest in the future to produce clean milk, and he should be rewarded for his efforts. Producers should hold together in this matter. Public sentiment is with the movement for a better milk supply and the prices of food stuffs and labor being high, the producers have every reason to demand a fair price for a good product. But they should see to it that their product is clean and that it deserves the price demanded. It is not for the producers' interests to allow the consumer to get the idea that this most valuable food product, milk, is produced and handled under dirty conditions. It is to

the interest of you producers to keep in close touch with the consumer—determine his wants and supply them—in this way you will secure his confidence and build up your business. The campaign of education that has been in motion for the past few years is going to evolve a new order of things in the milk business. Old methods will be superseded by new and the producer who has not a true conception of dairying will gradually be crowded out of the business. The dairy business is going to be placed on a scientific as well as business basis, employing educated and skilled labor and keeping only profitable cows. Are you on the right track?

Value to the Dealer.

Milk contests are of value to the dealer in assisting him to determine where the good dairies are, hence making it easier for him to find a supply of milk to meet the demands made upon him for a good product. With a supply of good milk to handle, there is less trouble with sour milk and less complaint from consumers.

Value to the Consumer.

The principal value of these contests to the consumer is in pointing out the defects in milk and showing him what good milk really is. Clean milk certainly ought to command a premium over dirty milk. With the average consumer, however, milk is looked upon as a necessity to be bought as cheaply as possible. If he is asked to pay a higher price, he immediately characterizes it as robbery. He gives little thought to the fact that the price of grain has been increasing during the past ten years and that wages for farm labor are not only higher but the labor is difficult to obtain. The consumer should know that it costs more to produce clean milk and that it means extra labor and extra care, and the dairyman cannot be expected to produce it without a reasonable profit.

Thompson says it costs twice as much to keep a cow today as it did ten years ago, and if milk kept pace in price with the feed that goes into it, a fair price today would be 15 cents a quart.

The majority of consumers do not know what good milk is.

ILLUSTRATION.

The consumer needs to be educated, for it is through him that this problem of clean milk will be eventually solved. If

the consumer does not know what clean milk is, and does not ask for it, and is satisfied to pay for dirty milk at dirty milk prices, then why should the dairyman produce clean milk? What is the use in legislating and enforcing city ordinances for a product that the people do not want? The consumer should not be willing to buy anything but clean milk. He should appreciate the fact that clean milk costs more. Erf has found that it costs only $9.00 per cow to produce milk any old way, and it costs $54.00 to produce clean milk. The consumer can be assured that the dairyman will take any necessary pains in producing milk even to giving the cows a daily bath if consumers demand it and will pay him for it.

I believe the time is soon coming in some of our cities when the health authorities, dairy farmers, milk dealers and consumers will all work together for a wholesome milk supply. Such working arrangement is not impossible at the present time in some of our cities. To accomplish this, the dirty dairies will need to be brought up to a reasonable sanitary condition, the health authorities asking for nothing unreasonable. The dairyman should be protected from unfair prosecution and from the competition of dirty milk, which now sells for the same price as clean milk in many instances. The interests of the public and of the dairymen are one, and just as soon as they can be made to see this, many of the present difficulties in the clean milk crusade will disappear. What most of us need is not more dairy knowledge but a better application of that we already know.

Meeting of the Illinois Buttermakers' Association.

Received from memberships	$133.00
Advertising	190.00
Sale of butter	112.85
	$435.85

Expenses.

Advertising and preparing for convention	$147.23
Convention expenses	106.19
Printing and postage of reports	107.66
Leaving balance on hand, which Mr. Fulmer turned over to me	74.77
	$435.85

On motion, duly seconded, the reports of the secretary and treasurer were adopted as read.

The Chairman:—The Board of Directors had a meeting during the winter to decide on the time and place for holding the next convention, and they found that the Illinois Dairymen were to hold a convention and were soliciting premium funds. The same class of people would be solicited by the two associations to donate money, and the probabilities were they would not donate to the two organizations. They did this in Chicago last year. We got our money from South Water street, but this year it looked as though those people would not be willing to donate to both associations, and some of the people interested in the buttermakers' welfare thought we had better have our meeting jointly with the Illinois Dairymen's Association. Mr. Zimmerman, the president of the Illinois Buttermakers' Association is not here; at that time he was in Kentucky and had to come to Chicago. Mr. Cook had gone to Wisconsin and could not attend, so it fell on me to consult with the people, not officers, but closely identified with the association, such as Mr. Caven and Mr. Schuknecht, and we decided the best thing to do was to hold the meeting here. For that reason I did not solicit advertising, did not get out any program, but the Dairymen's Association has discussions on its program that will be of interest to the buttermakers, so the Association here is a dual purpose one, and butter sent here is the same as though sent to the Buttermakers' Association.

There was another thing, the buttermakers did not feel like donating two tubs of butter, would not send one to each convention. Now it is up to us to decide whether we are to go ahead as a separate organization or to consider a plan to join with the Illinois Dairymen's Association. In the state of Iowa that was what the buttermakers had to do. I understand they never met with any success in their conventions until the two organizations were combined. Mr. Shilling and others have told me that. It is to be regretted that more buttermakers did not remain to this meeting; it is for them to say if they want to continue a separate and distinct organization or combine the two state organizations in one. I would like to hear from somebody on this matter.

Mr. Lee:—I agree with Mr. Newman's ideas. I feel that I know the buttermakers of the state pretty well and I know we are an army strong enough to carry any organization to a success or a failure, but the difficulty seems to be and always has been that it is a hard matter to get the buttermakers together, get them to stick together on one thing. I fear that if we remain as a separate organization, we will be carried along only by a few, and the time the association would last would depend on how long those few would be willing to work for the good of the Illinois dairymen. There is nothing that would help this matter any more than for us to associate ourselves with the State Dairymen's Association. We could then hold our meetings as has been suggested here; there might be a possibility that we could have one day for a meeting of our own, that of course to be arranged in the future, but we could have a separate day for our own discussions and get the buttermakers together.

Mr. Nelson:—Mr. Chairman, I endorse Mr. Lee's statement and agree that it would be better to have one association in the state rather than two, and both work together.

The Chairman:—You can readily see how it would be. We have to have a certain amount of money to print these annual reports, pay the stenographer and pay for badges and notices and secretary's work, and the only possible source of income is the advertising, butter fund and memberships, and I am satisfied that the supply people who contribute to this program would not contribute to two organizations. I know they would not take

advertisements in the two programs, and it is possible if the associations were combined they would contribute more freely.

Mr. Lee:—Mr. Caven, what steps would be necessary to take in order to combine with the Dairymen's Association?

Mr. Caven:—Merely to agree to do so. The matter has been discussed.

Mr. Lee:—Would the name be changed to the Illinois Buttermakers' and Dairymen's Association?

Mr. Caven:—The Dairymen's Association is incorporated as the Illinois Dairymen's Association. That could be easily changed and doubtless would, and I think it would be a nice change to make. I would be in favor of changing the name to the Illinois State Dairymen's and Buttermakers' Association. The Creamery Package Co. and the DeLaval Separator Co. each increased their subscriptions $10 this year because both state associations were to attend at this meeting.

Mr. Lee:—If it is in order, I move that the secretary, Mr. Caven, and Mr. Nelson arrange the matter so as to get recognition in the Dairymen's Association.

Motion seconded and unanimously carried.

Mr. Lee:—In combining the two associations, I believe it would be advisable to have it understood that one of the buttermakers be a member of the Board of Directors.

The Chairman:—I believe the Dairymen's Association will show a liberal spirit in recognizing the Association. This plan of consolidating was not suggested by the officers of this Association because of lack of desire to work for the organization, but because necessarily we would hold our meetings shortly after the dairymen held theirs and we would have to solicit funds, as I said before, from the very same parties. At first we thought of having our meeting with the National Dairy Show in Chicago last fall, but decided that was not the place to have it.

Mr. Caven:—There is this difficulty about soliciting for two associations in Illinois. In Minnesota and Wisconsin when they solicit funds they come to the commission men of Chicago and New York and receive liberal support. Illinois cannot ask the commission men of Chicago, New York or anywhere else to contribute to the premium fund, simply because the commission

men handle very little Illinois butter. Most of it is handled by the creamery companies direct, who either ship it or have their own outlets. Very little of that butter comes to South Water street unless it is not fit to go into the regular channels, and then it is thrown on the market; but the commission men do not feel that they owe any debt to Illinois buttermakers or dairymen at all, because they do not get any benefit our of their business. Minnesota, Iowa or Wisconsin have no large markets for butter; their butter comes into those big distributing centers and is handled there, and the merchants in those centers get the benefit of commissions from handling the butter, and of course feel liberal towards the associations in those states, but they will not contribute to Illinois. We never had any success in getting contributions from the commission men for our Dairymen's Association.

The matter of reorganization should be left to the officers to act on, and of course that action will depend on the sort of agreement that can be made. Unless the Dairy Association want to do what the buttermakers think is proper, perhaps they would not want to go in, but I do not think there will be any question about that.

The Chairman:—The principal thing we ought to ask for is to change the title of the Association to the Illinois Dairymen's and Buttermakers' Association, give us one day on the program, or in arranging the program to include in one day the subjects most interesting to the buttermakers, and to have a scoring contest with a liberal premium fund. I do not know of anything else we can ask from them except to give us recognition in the Board of Directors and officers.

Mr. Caven:—The principal thing is recognition in the name of the Association.

The Chairman:—You will notice in this annual report that the officers were authorized to get out incorporation papers. When the officers met to do that, they wrote around to different states and obtained by-laws and articles of incorporations from different associations; then this matter came up and the officers decided there would be no benefit in incorporating if we were going to affiliate with the other state associations, so nothing further was done.

In regard to the amount of money in the treasury, if we combine with the Dairymen's Association we will turn that money over to that body and try to have it understood that that amount is to go into the premium fund and thereby the butter-makers will profit by it.

If there is nothing further to come up at this time, we will now stand adjourned.

*CROPS FOR THE SILO, COST OF FILLING, AND EFFECT OF SILAGE ON THE FLAVOR OF MILK.

By Wilber J. Fraser, Chief in Dairy Husbandry, University of Illinois.

Advantage of Silage.

The digestive organs of animals that chew the cud are so formed as to require comparatively juicy and bulky foods. The cow cannot, therefore, thrive on exclusively dry food so well as can the horse. The nearest an ideal food that can be obtained for the dairy cow is good pasture; but for more than six months in the year green pasture is not available in Illinois. The best substitutes to use during this period are corn silage and such roots as mangels and turnips. Corn yields an average of twice as much dry matter per acre as do root crops; and, since the latter require much more labor, which in this country is relatively expensive, silage is far more economical.

Making corn into silage is a means of preserving the grain as well as the stalk in the best possible condition for feeding and without the expense of shelling and grinding. In feeding whole corn, either in the ear or shelled, many of the kernels are not digested. With silage, the grain being eaten with the roughage, nearly all the kernels are broken during mastication, and, since they are somewhat soft, are practically all digested.

By the use of the silo the corn is removed from the field at a time when no injury is done the land by cutting it up while soft. As the corn is cut before the blades are dry enough to shatter, there is no waste from weathering, and both stalk and grain being in good condition, the whole crop is consumed by the stock; while with dry shock corn a large percentage of the leaves and butts of the stalk is wasted.

It has been determined that one cubic foot of hay in the mow contains about 4.3 pounds of dry matter, and that a cubic foot of silage in a thirty-six foot silo contains about 8.9 pounds of dry matter. From this it is evident that a cubic foot of space in a silo of proper depth will hold more than twice as much dry matter as the corresponding space in a mow. It is also true that

*A bulletin on the construction of silos is now being prepared and will soon be published.

on the average a larger amount of digestible feed can be obtained from an acre in the form of silage than in any other way at like expense. Making corn into silage is then both an economical and compact method of storing feed.

Much damage has been done to the cause of silage by the extravagant claims of its over-enthusiastic friends. Although corn silage is not a complete and balanced ration in itself, it is so well relished that large quantities are consumed. Being a succulent feed, it tends to heavy milk production, and should be given an important place in the ration of dairy cows. It has proved an important factor in steer feeding as well as in milk production, but a steer cannot be finished on silage alone, any more than a cow can produce her best yield of milk on such a ration. To obtain the most economical returns, some dry roughage should be fed in connection with silage, and a legume hay, as alfalfa, clover, or cowpeas, is the best feed for this purpose, particularly for young stock and cows. Economical milk can be produced from these feeds without the addition of grain, if the cows are not giving more than two gallons of milk a day, providing the corn was well eared and both the silage and the legume hay are of excellent quality. Cows giving a larger yield must have grain added to their ration.

Value of Silage in Place of Soiling.

A pasture will carry much more stock during spring, early summer, and fall, than it will through the hot, dry weather of midsummer. By helping the pasture out at this season with partial soiling, the cattle not only have better feed during this critical period, but more stock can be carried on a given area than by pasturing alone. As land increases in value and farming becomes more intensive, there is greater need for soiling, and the most satisfactory method of providing a substitute is by means of the silo. It requires too much labor to cut green crops every day and haul them to the cows, and besides there is necessarily a great loss in being obliged to feed the crops before they are fully mature and after they are over-ripe.

No crop furnishes more feed to the acre than corn, and with the silo it can be utilized for soiling, thus permitting the whole crop to be harvested when at the right stage of maturity and fed when needed, saving both feed and labor.

Crops to Raise for the Silo.

In Illinois corn seems to be the best single crop for the silo. It not only produces a large quantity of nutritious feed that is easily placed in the silo, but it is of such a nature as to pack readily and keep well. The large southern varieties of ensilage corn, which give enormous yields in tons per acre, have been recommended for silage; but such varieties do not produce much grain and the total nutrients are usually less than from ordinary field corn. The best results are obtained with some variety that will give a good yield of grain, and by planting somewhat thicker than for a grain crop. Under average conditions a larger tonnage of feed can usually be obtained per acre by combining corn, sorghum and cowpeas or soy beans, but even with this combination the greater part of the crop should be corn.

Legumes, as clover and cowpeas, have the power, through bacteria on their roots, of utilizing the free nitrogen of the air and storing up within themselves a comparatively large amount of that most necessary constituent of food known as protein. By so doing they not only produce a food rich in protein without exhausting the soil, but enrich the soil by adding to its nitrogen. While they do not benefit the crop they are grown with, they do benefit the succeeding ones. When either peas or beans are grown with the corn and the entire crop is put into the silo, the feeding value is greater, ton for ton, than that of corn alone. This is a much more economical method of obtaining protein than by purchasing it in high priced concentrates, as gluten meal, oil meal, etc.

If cowpeas are planted at the same time as the corn and in the rows with it, they will usually make a fair growth, as shown in Cut 2. Since the vines will run up the corn stalks, the entire crop can be cut with the binder the same as corn alone, making practically no extra work in filling the silo. The only difficulty in harvesting corn and cowpeas with the corn binder is that, if the corn is missing for a rod in the row, there is nothing to carry the peas back into the binder, and it is likely to clog. Where there is a fairly uniform stand of corn, all can be readily bound together. As the stalks of soy beans are much stiffer than those of cowpeas, no difficulty is experienced in cutting them with the corn.

Increase of Nutrients During Maturity.

It is of great importance to know at what stage corn should be cut to secure the best results, how rapidly nutriment is stored up in the corn plant as it approaches maturity, and when the maximum amount is reached. The following table illustrates this point:

Table 1. Water and Dry Matter in Corn Crop at Different Periods after Tasseling. New York (Geneva) Station.

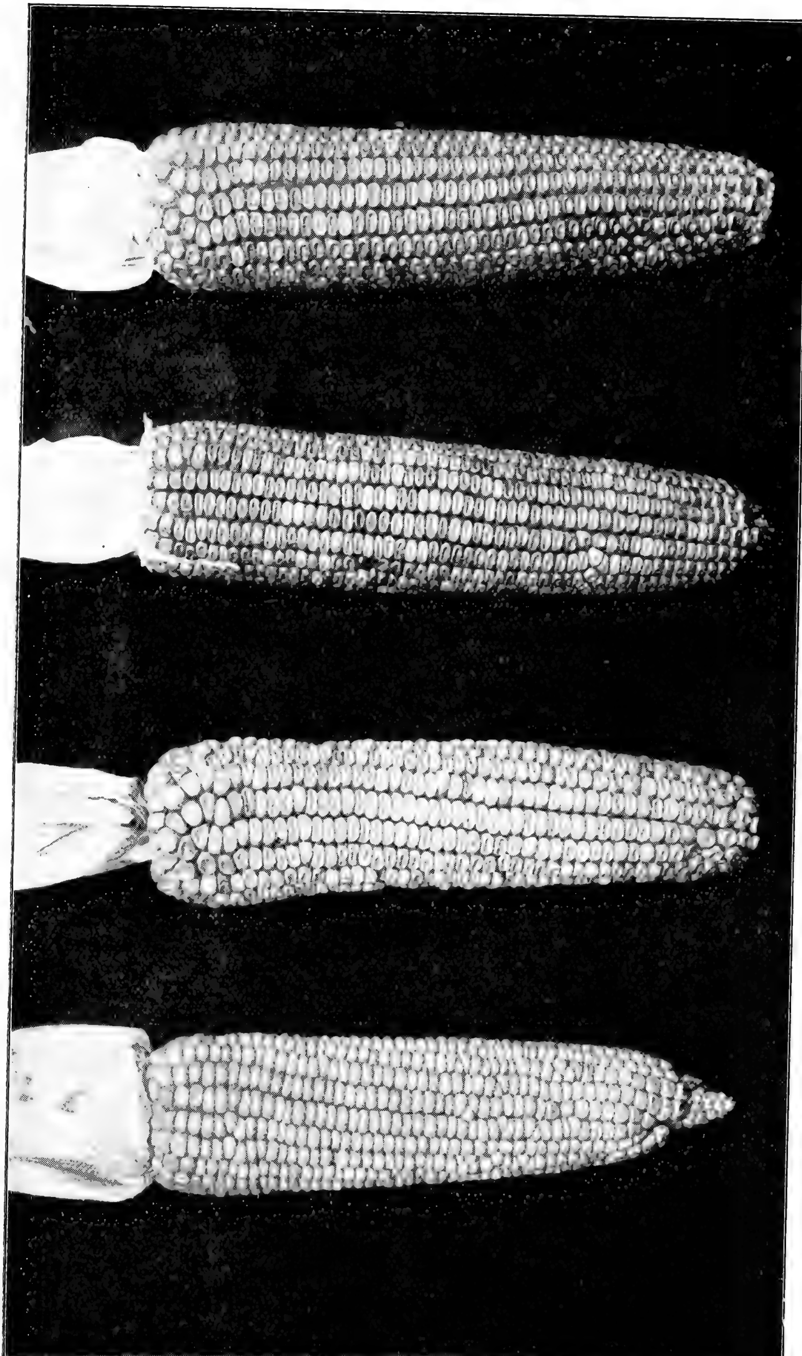
Date of cutting.	Stage of growth	Corn per acre. Tons.	Water per acre. Tons.	Dry Matter per acre. Tons.
July 30.	Fully tasseled	9.0	8.2	.8
Aug. 9.	Fully silked	12.9	11.3	1.5
Aug. 21.	Kernels watery to full milk	16.3	14.0	2.3
Sept. 7.	Kernels glazing	16.1	12.5	3.6
Sept. 23.	Ripe	14.2	10.2	4.0

In the last column is shown the dry matter per acre in corn at different stages. When the corn is fully tasseled it contains but eigh-tenths of a ton of dry matter per acre, or only one-fifth what it contains when fully ripe. When in the milk it contains nearly three times as much dry matter as when fully tasseled. Only seventeen days were occupied in passing from the milk to the glazing stage, yet in this time there was an increase in the dry matter of 1.3 tons per acre. This shows the great advantage of letting the corn stand until the kernels are glazed. After this period the increase in dry matter is but slight.

Time to Harvest.

To have the silage keep well the corn must be cut at the proper stage of maturity. If cut before it is sufficiently matured, too much acid develops. If too ripe, it does not settle properly and the air is not sufficiently excluded to prevent spoiling.

Corn should not be cut until the ears are out of the milk and most of the kernels glazed and hard. In Cut 3, ear No. 1 is in the soft dough stage; No. 2 is beginning to dent; No. 3 is nearly all dented, but a few kernels are still in the milk; No. 4 shows all of the kernels dented. When corn is put into the silo it should usually be as ripe as ears No. 3 and 4. In case the weather has been so hot and dry that the lower leaves have fired, the corn should be cut before the ears are quite so far advanced.



No. 1. **Soft-Dough Stage.** No. 2. **Half the Kernels Dented.** No. 3. **Nearly All Dented.** No. 4. **All Kernels Dented.**

Much riper corn will keep at the bottom of the silo than at the top, because of the greater pressure which excludes the air more completely. It is, therefore, important that the ripest corn be cut first and placed in the bottom of the silo.

Method of Harvesting.

The corn should be cut with a corn binder, as it is much more easily handled when bound in bundles. If the silage cutter is large and the work is pushed with a good force of men, the corn binder should have a start of half a day. If enough horses are used on the binder to keep it moving at a good pace the corn can usually be cut down as fast as it can be put into the silo.

It is always wise to have a silage cutter of large capacity. as much less labor is required in feeding it, and if the bundles are small, the bands need not be cut. Using a small cutter with a large engine is dangerous unless great care is exercised in controlling the power. Cut 1 shows a small-sized cutter filling a silo in the center of a barn. The day following the taking of this picture the machine was given too much power and the cutter wheel exploded. A piece of the wheel was found twenty rods distant and another piece was thrown through the inch siding of the barn, but fortunately no one was injured.

The chain elevator, as shown in Cut 5, is still occasionally used, but is likely to cause trouble. Where a carrier of this kind is desired, the single chain gives the best satisfaction. The customary, and usually the most satisfactory, way of elevating the cut material is by means of the blower, as shown in Cuts 6 and 7. To obtain the best results and not to be annoyed by clogging, the blower pipe should be run as nearly perpendicular as possible.

Essentials of Silo Filling.

If the silage is to keep well it must settle evenly. To this end the leaves and the heavier parts of the corn must be kept thoroughly mixed and evenly distributed in the silo. Owing to the great lateral pressure of silage, friction with the sides of the silo has a tendency to make the silage less compact at the edge, and for this reason it should be kept thoroughly tramped next the side. Every time three or four inches of cut material is added to the silo it should be tramped thoroughly around the edge, taking short steps and packing the silage as much as possi-

Cut 4.—Cutting Corn for the Silo with a Corn Binder.

ble next the wall. These precautions must be observed during filling to obtain perfect silage.

If the corn is so ripe that none having green leaves at the bottom of the stalk can be obtained to finish the last four or five feet at the top of the silo, water should be run into the carrier and the corn well soaked. If the corn is green, only enough water need be used to soak the upper six inches of silage.

Many different forms of covering for silage have been advocated, but it is usually found most practical to finish with the same material as that with which the silo is filled. Frequently a saving can be made by snapping off the ears and using the stalks alone, or by running enough straw, chaff, or weeds through the cutter to cover silage from four to six inches deep. If pressure is available, water can be run into the carrier to saturate this material. The top must be thoroughly soaked once and the whole surface well tramped ever day for a week to exclude the air as much as possible. This tramping should be especially well done around the sides, so that the air cannot gain access next the wall. The object of wetting the surface is to obtain as quickly as possible a thin layer of thoroughly rotted silage, which will seal the top, thus excluding the air and preserving the silage below.

If water is not added to the top, the heat dries out the silage, which may then "fire fang" to considerable depth, entailing a great loss.

Cost of Filling.

The data on the cost of filling silos, from which the Table 2 has been prepared, were secured by representatives of the Experiment Station, who went to different parts of the state when men were filling silos and kept accurate records of the work in progress.

In these records the time work began in the morning and stopped at night was noted, allowance being made for whatever time was taken at noon. With the exception of a few cases on dairy farms, where some of the men quit early to milk, no allowance was made for time lost after the cutter started and men and teams were ready for work, a full day being counted unless for some reason all work stopped and men and teams were at liberty to leave.

TABLE 2.—DATA ON COST OF FILLING SILOS.

Farm number	1	2	3	4	5	6	7	8	9
Diameter silo, feet	18.25	18	22	18	19	18.8	11.8x12.9 (square)	20	*20
Depth silage, feet, after settling 48 h.	31	23.5	24	27	33	29.5	22.7	22	38.7
Tons silage est. from above dimensions	162.7	106.4	163.7	129.8	193.1	161.5	61.2	119.6	785.7
Acres cut	27.3	15.5	25	15.4	20	24.25	10	16	67.6
Tons per acre	5.96	6.86	6.55	8.4	9.65	6.66	6.12	7.47	11
Distance hauled, rods	100	110	160	60	160	80	60	20	100
Teams hauling	6	5.5	6.5	4	3.5	2.5	3.5	4	7
Days' labor, teams, 10 h.	24.5	13.6	24.9	12	20.25	16.55	7	9.3	70.4
Days' labor. men, 10 h.	36.3	17.7	36.4	19.3	33.3	25.9	15.75	16 5	145.25
Kind of cutter	Papes	BelleCity	BelleCity	Star 18	Star 17	Star 16	Blizzard 12	Blizzard 14	Porter Bros.
Kind of elevator	Blower	Blower	Blower	Carrier	Carrier	Carrier	Blower	Blower	Carrier
Length of cut, inches	.75	.5	.5	1.25	1	1	.5	.5	2
Size of engine, h. p.	15	20	20	12	8	8	17	12	16
Engine hire	$16.50	$10.50	$16.00	$11.00	23.75	$20.00	$8.00	$7.50	$39.00
Use of cutter	6.60	4 20	6.40	4.40	9.50	8.00	3.20	3.00	15.60
Cost of fuel	6.30	3.75	6.00	2.25	6.75	7.05	1.95	4.05	16.50
Cost of twine	6.87	7.15	12.00	5.72	7.15	6.87	2.09	6.05	35.75
Labor, $1.25 a day	45.37	22.14	45.50	24.12	41.62	32.37	19.69	20.62	181.56
Teams. $1.00 a day	24.50	13.60	24.90	12.00	20.25	16.55	7.00	9.30	70.40
Cost of filling silo	106.14	61.34	110.80	59.49	109.02	90.84	41.93	50.52	357.81
Cost in cents per ton	**.65**	**.58**	**.68**	**.46**	**.56**	**.56**	**.63**	**.42**	**.46**

*Three silos same size.

TABLE 2—CONTINUED.—DATA ON COST OF FILLING SILOS.

Farm number	10	11	12	13	14	15	16	17	18	19
Diameter of silo, feet	14	20.6	*14, 13 3	15.25 (octagon)	9.75	16	16	16.3	†20, 12	†20,12
Depth silage, ft., after settling 48h	27	34.7	29	20.5	19.75	28	22	20	34.5, 18	28.8, 24
Tons silage estimated from above dimensions	78.6	244.28	166	65.8	23.5	108.1	76.5	69.86	260.4	224 85
Acres cut	13.75	33.25	17.5		3.6	11.5	6	6	40	24
Tons per acre	5.71	7.34	9.48		6.8	9.4	1.75	11.64	6.51	9.36
Distance hauled, rods	68	295	160	30	215	80	100	60	360	240
Teams hauling	5.5	7	6	4	7	5	6	4	7	6
Days' labor, teams, 10 h	8.7	37.4	22.6	9.5	4.35	11.38	5.25	5.25	43.6	31.6
Days' labor, men, 10 h	13.7	54.9	44.2	15.8	7.2	19.4	11.4	12.7	69.9	53.3
Kind of cutter	Ohio 18	Ohio 18	Ohio 18	Blizz'd 12	Blizz'd 14	Ohio 18	Ohio 18	Ohio 18	Blizz'd 14	Blizz'd 14
Kind of elevator	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower	Blower
Length of cut, inches	.5	.5	.5	.5	1	.75	5	.5	.5	1.25
Size of engine, h. p.	20	20	20	17	18	15	20	20	18	20
Engine hire	$5.50	$20.00	$15.00	$8.50	$2.25	$7.00	$4.38	$4.38	$21.50	$18.50
Use of cutter	2.20	18.00	6.00	3.40	.90	2 80	1.75	1.75	8.60	7.40
Cost of fuel	3.00	9.00	6.00	2.70	1.00	3.00	3.00	2.25	14.02	9.00
Cost of twine	4.18	8.80	5.94	3.30	1.10	5.10	1.65	1.65	10.72	6.05
Labor, $1.25 a day	17.12	68 62	55.25	19.75	9.00	24.25	14.25	15.87	87.37	66.62
Teams, $1.00 a day	8 70	37.40	22.60	9.50	4.35	11.38	5.25	5.25	43.60	31.60
Cost of filling silo	40.70	151.82	110.79	47.15	18.60	53.53	30.28	31.15	185.81	139.17
Cost in cents per ton	**.52**	**.62**	**.67**	**.72**	**.76**	**.50**	**.40**	**.45**	**.71**	**.62**

*Two silos same depth
†Two silos

Cut 7.—Filling the Silo. Blower Pipe Should Be as Nearly Perpendicular as Possible.

To reduce the cost of filling the different silos to a like basis, the charge made in these records for each of the various operations was uniform, and as near as possible to the average price paid. The labor of the men was charged at $1.25 and of the teams at $1.00 each for a day of ten hours. This was considered a fair price,, as the time of year in which silos are filled is not usually an especially busy season on the farm. In most cases the man who had the silo also owned an ensilage cutter, and a uniform charge of $2.00 a day was made for wear on the machine and interest on the money invested. The engine, including the engineer, was charged for at $5.00 a day; fuel at $3.00 a ton for coal and 15 cents a gallon for gasoline; twine at 11 cents a pound. The charge for machine and engine, fuel, twine and labor of men and teams, gives the total expense of filling the silo.

To determine the capacity of the different silos the diameter of each and the depth of the silage after settling forty-eight hours were carefully measured. From these dimensions the number of tons of silage was estimated from a table on the capacity of silos. Having the acres cut, a total cost of filling and tons of silage, the tons per acre and average cost per ton of putting up silage were computed.

The cost of filling ranged from 40 cents to 76 cents per ton, the average for the total number of tons put up being 56 cents. This variation was caused by the distance the corn was hauled, and the ability of some farmers to arrange the work more systematically and push it with greater energy than others.

Effect of Corn Silage on the Flavor of Milk.

Ever since silage has been used as a feed for dairy cows, there has been more or less controversy over its effect upon the flavor of milk, the objection being occasionally raised that milk from silage-fed cows had an unpleasant, if not a disagreeable, flavor. To determine what foundation, if any, there was for this belief, the experiment herein described was undertaken and conducted in the following manner:

The University dairy herd was divided into two lots, one of which was fed forty pounds of corn silage per cow per day, which is the maximum amount for economical feeding, together

with a small amount of clover hay and grain. The feed for the other lot consisted entirely of clover hay and grain.

The milk from both lots was cared for in exactly the same manner, being removed from the barn as soon as drawn and taken to the dairy building, where it was cooled. After standardizing to four percent butter fat, that there might be no difference in flavor of the milk from the two lots on account of a variation in this respect, the milk was put in half-pint bottles and sealed.

In each case, before asking for a comparison, a bottle of milk from each lot of cows was agitated to incorporate the cream thoroughly, and the milk in each bottle was poured into a separate glass. Three questions were then asked the person whose opinion was desired: First, "Is there any difference in the two samples?" Second, "Is there anything objectionable about either?" Third, "Which do you prefer?" The answers are summarized in Tables 3, 4, 5, and 6. In every case the milk was known by number only and those whose opinions were obtained were not told concerning the manner of production, that their judgment might be unbiased by any prejudice they might have had as to the use of silage in milk production.

The people whose tastes were consulted were divided into three classes, ladies, men of the faculty, and men students. In the first case, as reported in Table 3, the silage had been fed one hour before milking. Of the 29 ladies, 10 preferred the silage milk, 14 the non-silage, and 5 had no choice. Of the men of the faculty, 27 preferred silage milk, 20 the non-silage, and 7 had no choice. Of the students, 20 preferred silage milk, 4 non-silage, and 4 had no choice.

A preference for silage milk was indicated by 51 per cent of the 111 tests made when silage was fed one hour before milking. When silage was fed at time of milking, 71 percent preferred silage milk, and when fed after milking, 51 percent reported the same preference.

The following tables give the time of feeding silage, class of people tasting milk, number of tests made, and the milk preferred:

Table 3.—Silage Fed One Hour Before Milking.

Number of people tasting milk.		Kind of milk preferred. Silage.	Non-Silage.	No Choice.
Ladies	29	10	14	5
Men of the faculty	54	27	20	7
Men students	28	20	4	4
Total	111	57	38	16

Table 4.—Silage Fed at Time of Milking.

Number of people tasting milk.		Kind of milk preferred. Silage.	Non-Silage.	No Choice.
Ladies	30	14	16	
Men of the faculty	17	11	4	2
Men students	121	94	25	2
Total	168	119	45	4

Table 5.—Silage Fed Immediately After Milking.

Number of people tasting milk.		Kind of milk preferred. Silage.	Non-Silage.	No Choice.
Ladies	22	9	7	6
Men of the faculty	43	21	10	12
Men students	28	17	9	2
Total	93	47	26	20

Table 6.—Summary of Results.

Number of people tasting milk.		Kind of milk preferred. Silage.	Non-Silage.	No Choice.
Ladies	81	33	37	11
Men students	177	131	38	8
Men of the faculty	114	59	34	21
Total	372	223	109	40

The summary of all results shows that of the 372 tests made, 223, or 60 percent, preferred silage milk; 40, or 11 percent, had no choice; and 109, or 29 percent, preferred the non-silage milk. The people who chose the non-silage milk were, as a rule, those who do not drink milk, hence their opinion is not so important as is that of the people who consume milk more freely.

Samples of silage and non-silage milk were sent to five milk experts in Chicago and other cities, accompanied by a letter asking the same three questions. One of these experts had no choice, one decided in favor of the non-silage, and three preferred the silage milk.

It will be noticed from the tables that most people could detect a difference in the flavor of the two samples of milk, but it was expressly stated in every case that there was nothing objectionable about the flavor of either sample.

To determine further whether the public generally objects to silage milk, twelve half pint bottles of such milk were delivered at the best hotel in the Twin Cities each day for a month, making 360 samples in all. These were served to guests who drank milk and no complaint or criticism of any kind was made.

For the past nine years the Department of Dairy Husbandry at the University has delivered from 100 to 150 quarts of milk a day to people in the two cities. During this time the cows have been fed an average of about forty pounds of silage per day, except when on pasture, and no complaints of a bad flavor in the milk have been received.

Mr. H. B. Gurler of DeKalb, who is one of the most progressive dairymen of the state, has been producing certified milk for the past ten years and selling it in Chicago at 12 cents a quart. All of this time Mr. Gurler has been feeding silage to his cows, excepting during the season of the year when pasture was abundant, and with the best of results.

This is strong evidence that if the silage is of good quality and used in reasonable amounts in connection with other feed, it is one of the best feeds obtainable for dairy cows when pasture is not available. It must be remembered that in all of this work nothing but good silage was fed and no spoiled silage was allowed to accumulate in or around the silo. When silage imparts a bad or disagreeable flavor to the milk produced from it, almost invariably the cause is that the silage has not been fed properly, or that spoiled silage has been used.

It should not be understood from this discussion that the time of day a food is fed which may impart a bad flavor to the milk is of no consequence. All feeds of this nature should be fed after milking and not before, to avoid the possibility of producing an unpleasant flavor in the milk.

THE CONSTRUCTION OF SILOS.

By Wilber J. Fraser, Chief in Dairy Husbandry, University of Illinois.

Introduction.

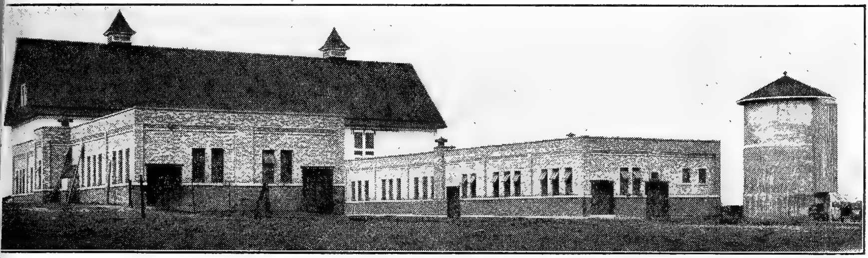
There has been much discussion through the agricultural press and at farmers' institutes concerning the importance of the silo and the advantages and disadvantages of the different styles of construction. As yet, however, comparatively few dairymen and stock raisers of Illinois fully appreciate the value of silage, and as there are not one-tenth as many silos in the state as the economy of silage as a feed, especially for dairy cows, would warrant, the Experiment Station has deemed it wise to issue two bulletins on this subject.

Bulletin No. 101, recently published, discusses the subject of crops for the silo and cost of filling. The aim of this bulletin is to direct attention to some of the essential points in silo construction and also to show the serious defects in some styles of silos, both in the material used and in the manner of construction. Cheap silos which are poorly built have done much to injure the cause of silage, for since they do not preserve their contents perfectly there is necessarily great loss. The problem is, therefore, to build an enduring, air-tight, rigid structure at least expense.

Essentials of a Silo.

There are several points that must be closely observed in making silage if it is to be well preserved, and the neglect of any one of these will make, in the final result, the difference between success and failure. These essentials are close packing, when the crop is at the proper stage of maturity, in an air-tight structure having perfectly rigin walls.

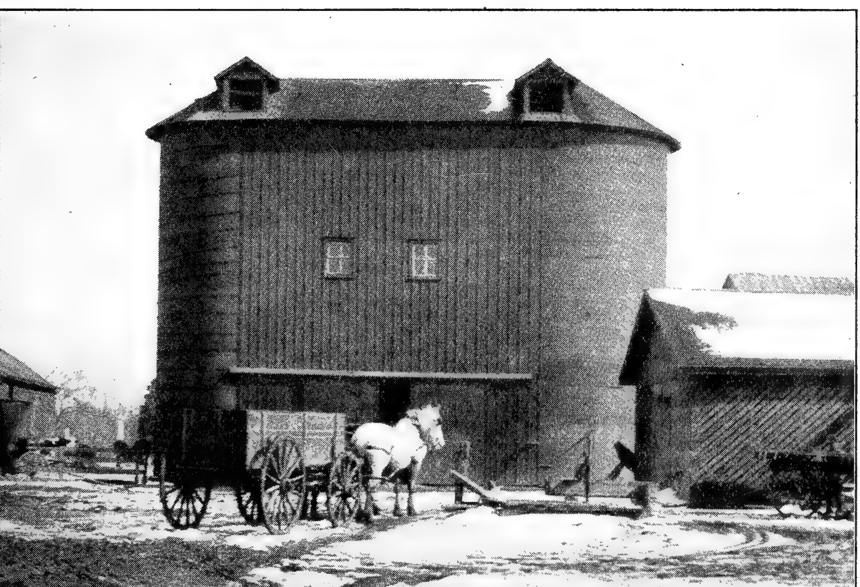
The stage of maturity and method of packing were treated in Bulletin No. 101 (a copy of which can be obtained from the Illinois Experiment Station, Urbana, Illinois.) Of equal if not greater importance, is the proper construction of the silo. If the sides of the silo are not air-tight, the air which passes through will cause the silage to spoil, and if the walls are not perfectly rigid, the pressure of the silage will cause them to spring out, allowing the air to enter between the silage and the wall. In either case the result will be the same—decayed silage.



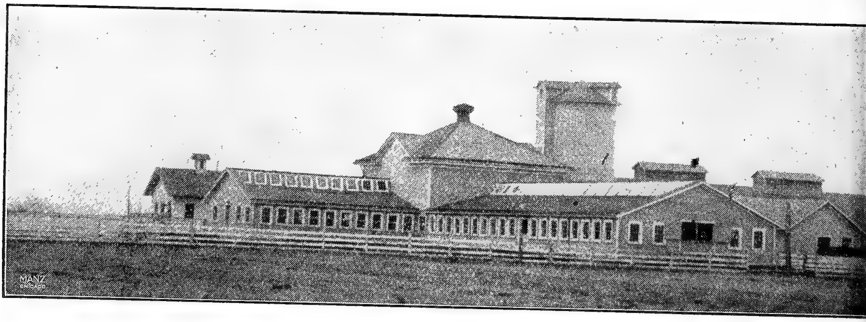
Cut 1.—Large Cement Silo to Which Cow Stable is to be Extended.

The outward pressure on the wall of a silo filled with cut corn is about 11 pounds for every foot in depth; making a pressure of 110 pounds at a depth of 10 feet; 330 pounds at a depth of 30 feet; and the enormous pressure of 440 pounds per square foot at a depth of forty feet. This increase in pressure as the depth increases must be considered in silo construction and the lower portion made much the stronger.

Before building a silo the most careful attention should be given to location, size, form, and method of construction. These



Cut 2.—Two Round Silos Forming End of Barn.

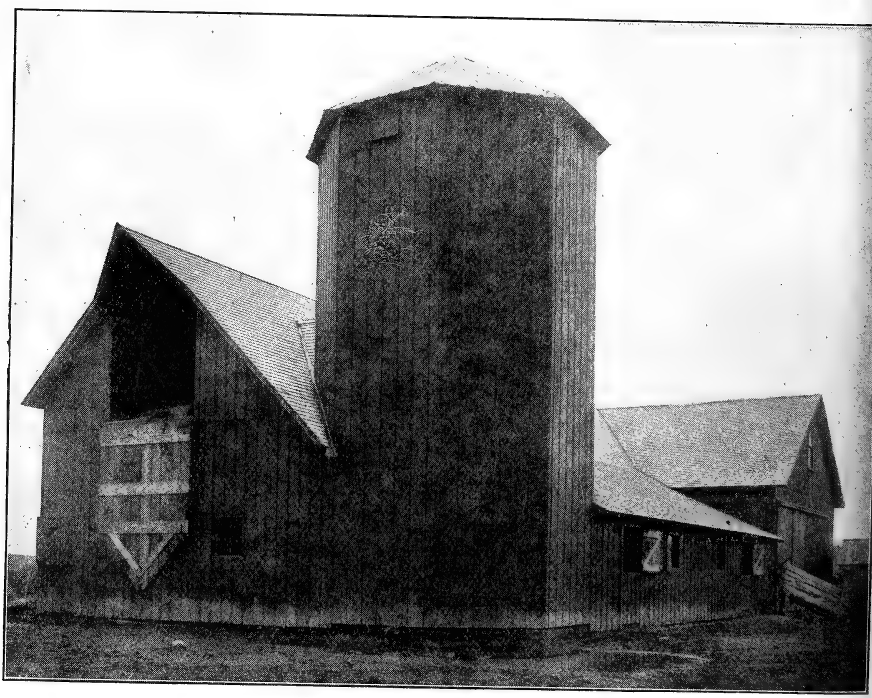


Cut 3. Silo Located at Intersection of Cow Stables.

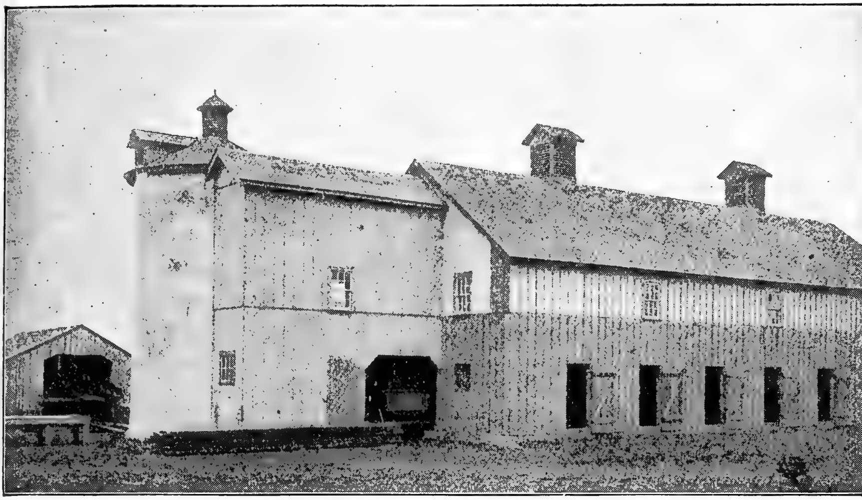
will differ somewhat according to locality and individual needs. A brief discussion of these questions follows:

Location.

As silage contains about 80 per cent water it is a heavy feed to handle, and, to avoid unnecessary labor in feeding, the silo should be placed as near the manger as possible, preferably

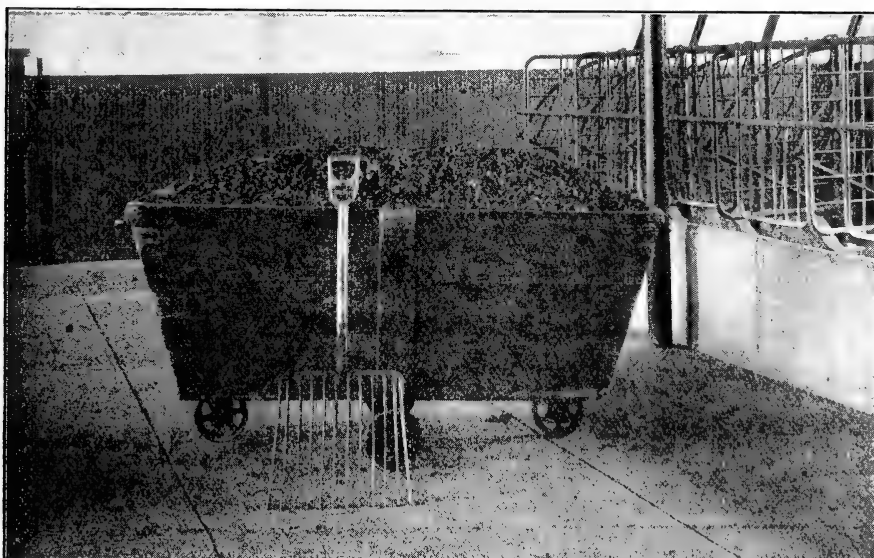


Cut 4.—Octagonal Silo Located in Corner of Barn.



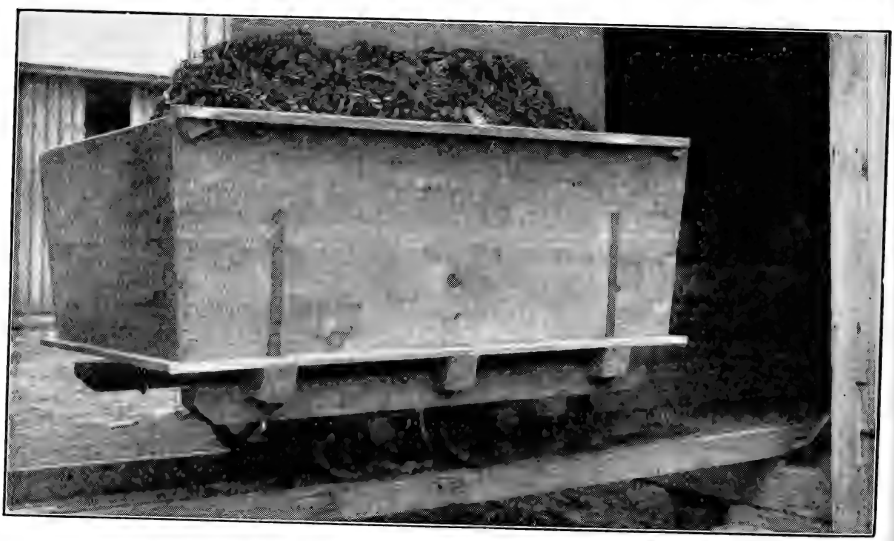
Cut 5.—Showing Connection of Silo with Barn.

at one end of the feeding alley. If the silo is inside the barn the silage chute should be provided with a door which should be kept closed to prevent the silage odors from entering the barn at milking time, thus avoiding the possibility of their being absorbed by the milk.



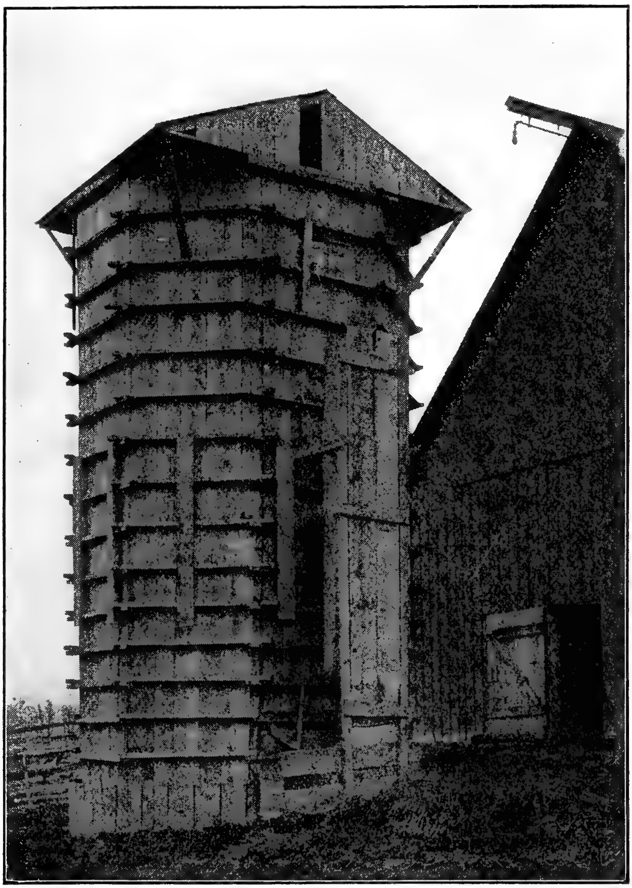
Cut 6.—Silage Cart for Use on Cement Floor.

Cut 7.—Where Necessary to Fill Hay Loft from End of Barn at Which Silo Is Located, a Movable Track and Car May Be Used to Carry Silage to Manger.

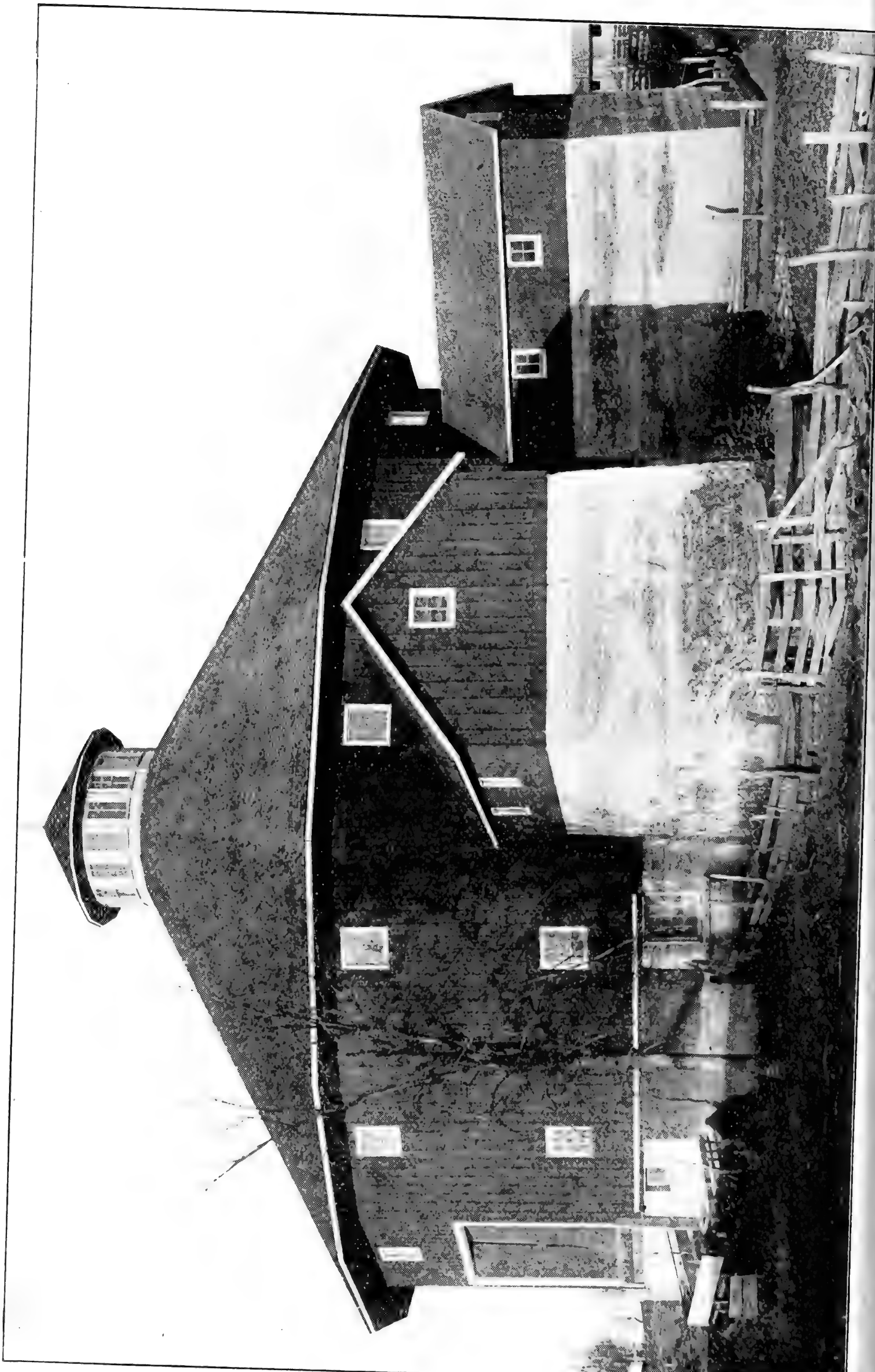


Cut 8.—Silage Car to Run on Movable Track.

Where there is a smooth level floor from the silo through the feeding alley, a cart similar to the one shown in Cut 6 will prove a great convenience in feeding. When built outside the barn the silo should be within a few feet of it and connected by a covered passage. Where it is desired to drive up to the barn with grain only, the arrangement may be as in Cut 5. If it is necessary to fill the hay loft from the end of the barn at which the silo is located, a movable track for the silage car can be arranged to extend from the silo to the barn ,(Cut 7) with a car constructed as shown in Cut 8. Cuts 1, 2, 3, and 4 show how silos ma ybe conveniently located.



Cut 9.—Cheap Octagonal Silo Which Did Not Preserve Its Contents Perfectly. This is Not a Good Shape Even When Properly Constructed.



Cut 10.—Square Cement Sil

Form of Silo.

Nearly every one who builds a silo adds some new feature, giving rise to a great variety of shapes and methods of construction. Before building a silo it is well to consider both the advantages and the disadvantages of the different styles, as well as the cost of each. It should be borne in mind, however, that no silo is cheap, no matter how small the first cost, if it does not preserve the silage perfectly. The first silos in this country were usually built inside the barn and consequently the square form was commonly used in order to utilize the space more completely. The square silo has not proved satisfactory, however, as it is practically impossible to build this form so that the side walls will not spring out and allow the air to pass down between the silage and the wall, which invariably results in the rotting of the silage. Another difficulty with the square form is that the silage does not settle readily in the corners and there is consequently considerable loss from this cause. Square silos having heavy cement walls are shown in Cut 10, but even these have cracked, allowing the air to enter.

An example of great loss owing to the form and faulty construction came under the writer's notice a few years ago when a square silo with a capacity of fifty tons, was built with air-tight, but not rigid walls. Simply the springing of the sides of the silo allowed the air to gain access to the silage to such an extent that the entire fifty tons spoiled completely. Since for mechanical reasons it is practically impossible to build a square wood silo with perfectly rigid walls, the round silo is the only proper form.

Silage has been put up at the University for the past seventeen years. The first silos were square and built inside the barn. These were made of two thicknesses of ⅞-inch flooring with paper between. After having been used seven or eight years the double walls began to show signs of decay, and after nine years the walls were so badly rotted that the silo was useless. If silos are to be built of wood the wall should be of but one thickness. The difficulty with double walls is that moisture gets between the two layers of wood and as it does not dry out readily, decay follows rapidly.

Proportion and Capacity of Silos.

To obtain satisfactory results, silage must be in perfect condition when fed. Since fermentation soon takes place when sil-

Cut 11.—Brick Foundation 4¼ Feet Deep. 2x4 Sill Imbeded in Cement on Top.

age is exposed to the air, the silo should not be of too great diameter. Not more than eight square feet of surface should be allowed for each cow in winter, then, when feeding 40 pounds of silage per cow, a layer about 1½ inches deep would be fed off daily. When silage is fed in summer it is advisable that the exposed area be not over half this size, so that a layer three inches deep may be used daily. However much stock is to be fed, a silo 20 to 22 feet in diameter is as large as should be built. If a silo is of greater diameter than this, much of the silage is at too great distance from the door, increasing the labor of removal.

The deeper the silo the greater the pressure and the more compactly will the silage be pressed together, hence the larger the amount that can be stored per cubic foot. For example, a silo 20 feet in diameter and 40 feet deep will hold twice as much as one of the same diameter and 25 feet deep. This shows the economy of reasonably deep silos. To be well proportioned the height should not be more than twice the diameter. No silo should be less than 30 feet deep, and to get sufficient depth for a silo not over 12 feet in diameter, it may be placed 4 or 5 feet into the ground.

The number of tons of silage needed can readily be estimated from the size of the herd and the amount to be fed daily. Even when it is desired to feed as much silage as possible not more than 40 pounds per cow should be fed daily. In Illinois, silage will usually be needed from about October 20 to May 10, or 200 days. Each cow should have an allowance then of 200 times 40 pounds, which is 8,000 pounds of silage, or four tons per cow for the year. A herd of ten cows will require a silo holding 40 tons; a herd of 30 cows 120 tons; 50 cows 200 tons; and 100 cows 400 tons. Where young stock is raised an allowance should be made for them. From the amount of silage needed the dimensions of a silo of the required capacity may be determined from Table 1, which gives the capacity in tons of silos of different diameters and depths. . These estimates apply to silos filled with well matured corn that has been allowed to settle forty-eight hours and then refilled. It is evident that to get this rated capacity a silo which had been filled rapidly must be refilled after settling forty-eight hours.

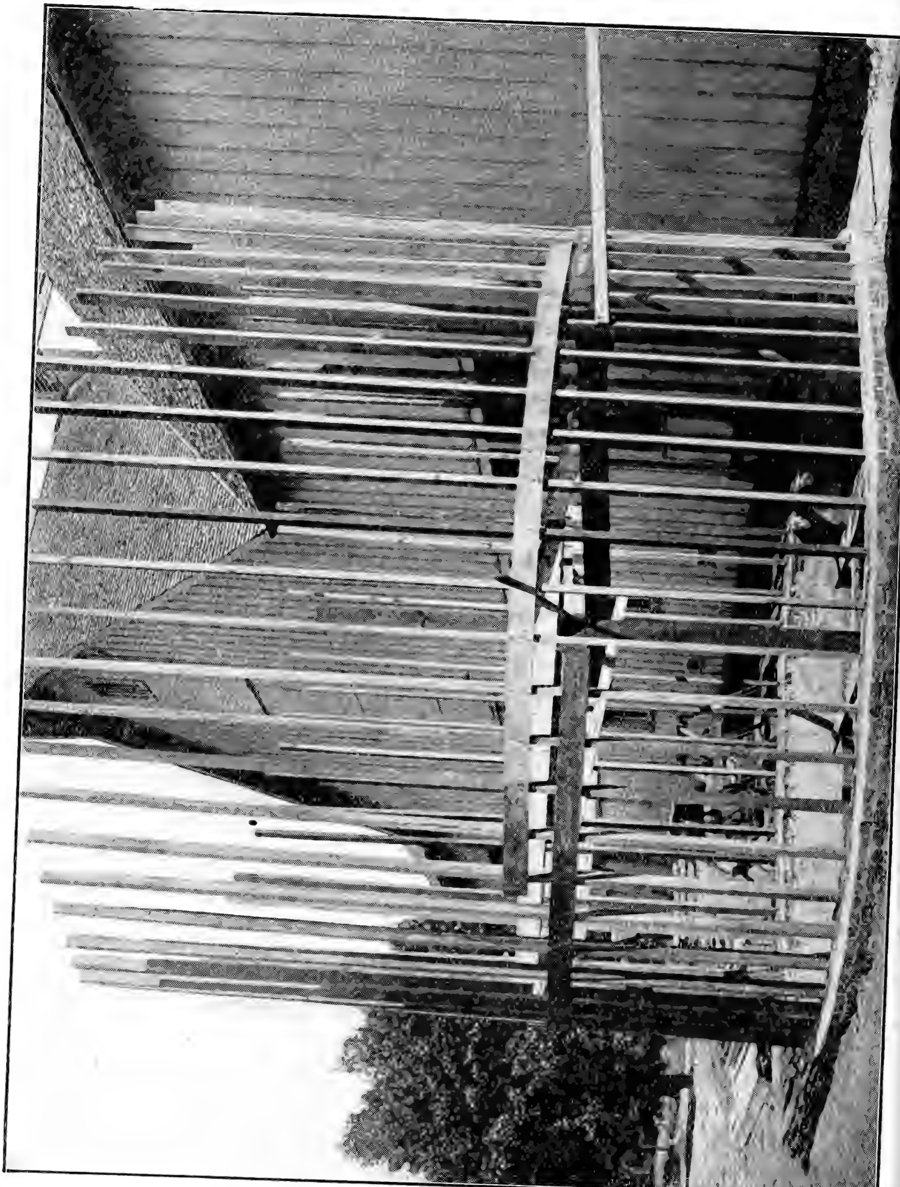


Table 1.—Approximate Capacity in Tons of Cylindrical Silos of Different Diameters and Depths, Computed from King's Table.

(The diameter is shown at the top of the columns and depth at the left.)

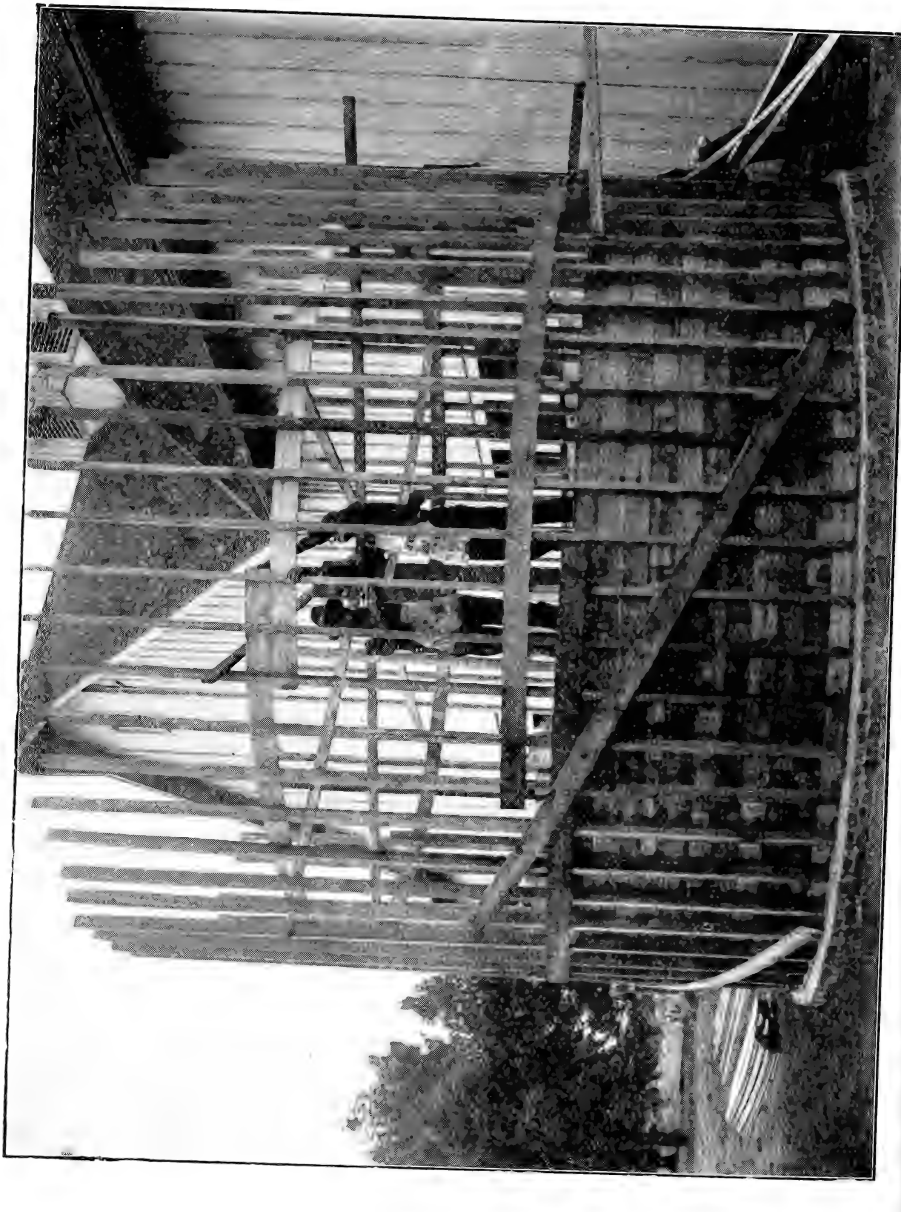
Inside Diameter in Feet.

Ft.	10	11	12	13	14	15	16	17	18	19	20	21	22
20	26.2	31.6	37.7	44.2	51.2	58.8	67	75.6	84.7	94.4	104.6	115.3	126.6
21	18.0	33.8	40.3	47.2	54.8	62.9	71.6	80.8	90.6	109.9	111.8	123.3	135.3
22	29.9	36.2	43.0	50.5	58.6	67.4	76.5	86.4	96.8	107.9	119.6	131.8	144.7
23	31.9	38.6	45.9	53.9	62.5	71.7	81.6	92.1	103.3	115.1	127.5	140.6	154.3
24	33.8	40.9	48.7	57.2	66.3	76.1	86.6	97.8	109.6	122.1	135.3	149.2	163.7
25	35.8	43.3	51.6	60.5	70.2	80.6	89.6	103.6	116.1	129.3	143.3	158.0	173.4
26	37.9	45.9	54.7	64.2	74.4	85.5	97.2	109.8	123.0	137.1	151.9	167.5	183.8
27	40.1	48.5	57.7	67.7	78.6	90.2	102.6	115.8	129.8	144.7	160.3	176.7	194.0
28	42.2	51.1	60.8	71.3	82.7	95.0	108.1	122.0	136.8	152.4	168.9	186.2	204.3
29	44.4	53.7	63.9	75.0	87.0	99.9	113.7	128.3	143.9	160.3	177.6	195.8	214.9
30	46.6	56.4	67.2	78.8	91.4	105.0	119.4	134.8	151.1	168.4	186.6	205.7	225.8
31	48.8	59.1	63.3	82.5	95.7	109.8	124.9	141.1	158.2	176.2	195.2	215.3	236.3
32	51.1	61.9	73.2	86.4	100.2	115.1	130.9	147.8	165.7	184.6	204.6	225.5	247.5
33	53.4	64.6	69.9	90.3	104.8	120.5	137.8	154.6	173.2	183.1	214.1	235.8	258.7
34	55.8	67.5	80.3	94.3	109.3	126.0	142.8	161.6	180.8	201.7	223.6	246.2	270.0
35	58.2	70.4	83.7	98.3	114.0	131.6	148.9	168.7	188.3	210.5	232.2	256.8	281.5
36	60.6	73.0	86.9	102.2	118.3	136.3	154.7	175.0	196.3	219.4	242.0	207.5	292.1
37	63.1	76.0	90.4	106.1	123.1	142.1	160.8	183.2	204.3	228.0	251.9	278.4	303.9
38	65.5	79.0	94.0	110.3	127.9	148.0	167.0	190.7	212.4	237.2	261.9	289.4	315.9
39	67.9	82.0	97.3	114.5	132.8	154.0	173.5	198.3	220.6	246.5	272.0	300.5	328.1
40	70.3	85.1	101.1	118.8	137.8	160.1	180.0	205.0	228.9	225.9	280.2	311.8	340.4

Round Wood Silo Plastered With Cement.

The silo described below, which is 20 feet in diameter and 34½ feet deep, having a capacity of 228 tons, was built at the University of Illinois the summer of 1903. The first silos of this kind built in the state, so far as known by the writer, were three erected by Mr. H. B. Gurler, of DeKalb, in 1897. (This is the style of construction frequently referred to as the Gurler silo). These three silos have been filled every year, and have given most excellent satisfaction. It seems probable that silos of this construction will not only preserve the silage perfectly, but will prove to be lasting as well as economical for most sections of the state. As few silos of this type have as yet been built in Illinois, a detailed description of the one at the University is given.

The excavation and foundation were made by cutting a circle 20 feet 10 inches in diameter and four feet deep, and laying up a four-inch brick wall against the clay. (Cut 11). This wall was slushed in full on the back side with mortar so that every



Cut 13.—Silo Ceiled on Inside to Height of Six Feet.

brick had a full bearing against the clay to resist the great outward pressure of the silage. Where the clay is solid a two-inch brick wall is quite sufficient. Three feet from the bottom and within one foot of the top of the ground the wall was thickened to eight inches and carried up six inches above the grade line. Where the grass is not kept down around the silo the brick wall should be higher to protect the wood from dampness.

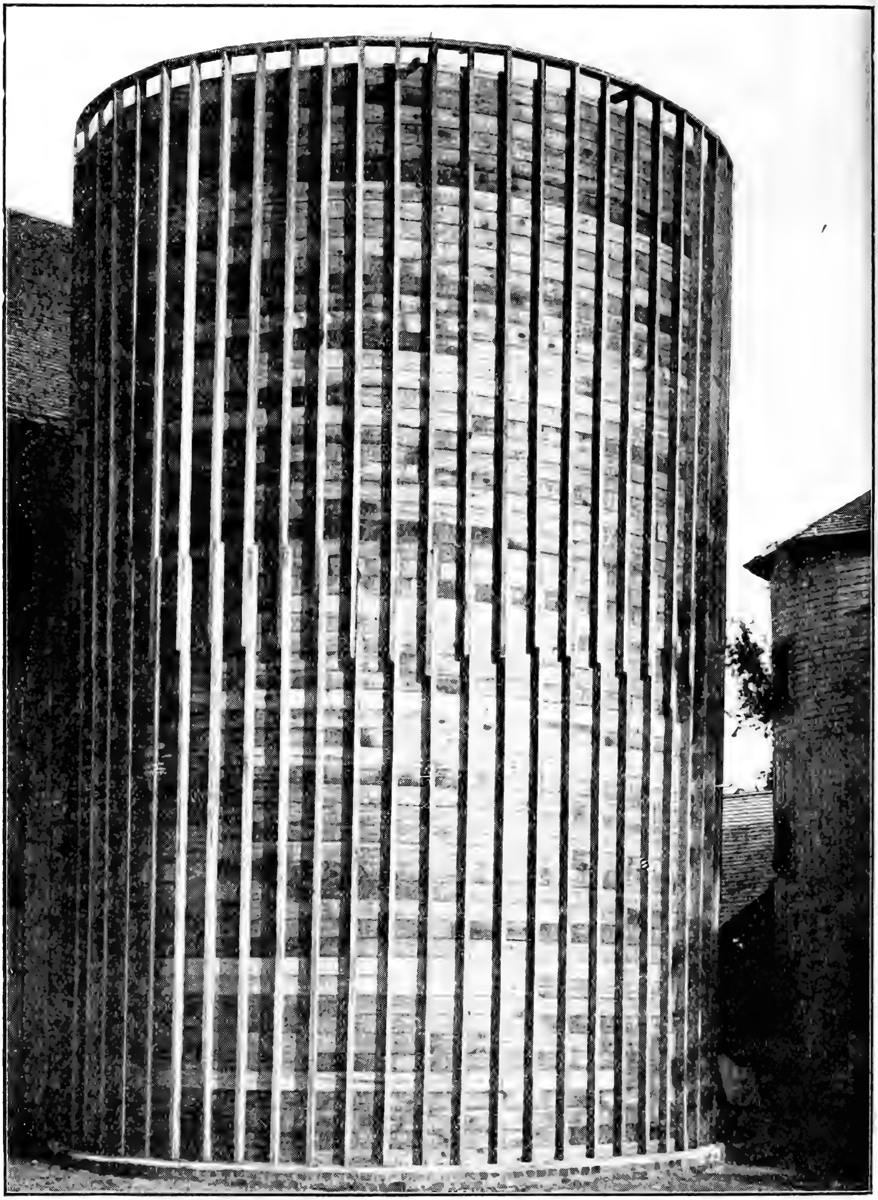
When a silo is placed in the ground, unless there is good natural drainage through the subsoil, tile must be laid to drain the bottom or difficulty is almost sure to be experienced with water in the pit.

The wall of this silo should have been strengthened by imbedding an iron hoop in it just above the ground, for an eight-inch brick wall does not have sufficient strength to withstand the outward pressure of the silage at such a depth. This silo wall has cracked slightly in two or three places.

The sill was made of 2x4's cut into two foot lengths; these were thoroughly imbedded in mortar on top of the wall. The upper two feet of the wall was laid in mortar made of one part Portland cement to two parts of sharp sand, and the entire foundation was plastered with a thin coat of this mortar.

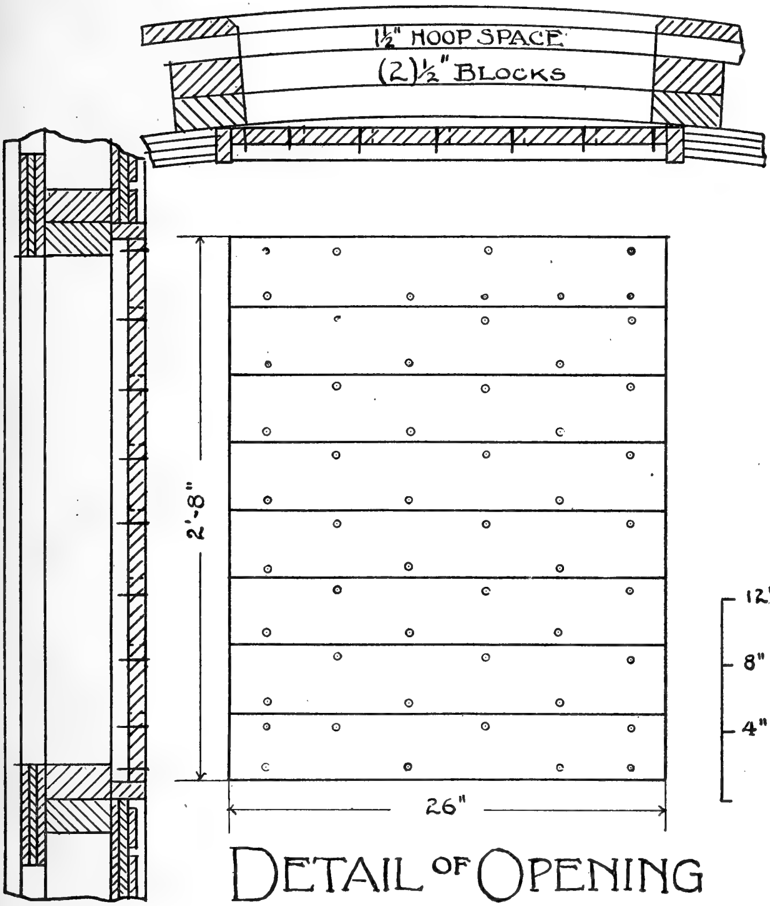
The studs, which were 16 foot 2x4's, were set on the sill and toe-nailed to it. A large post sixteen feet long was set in the ground in the center of the excavation, and boards extending from this to the studs about six feet above the foundation, held the studs perpendicular to this height. (Cut 12). A half-inch board was then bent around the outside of the studs at this height and the studs were tacked to it as fast as they were plumbed. These boards held the studs perpendicular and in a circle to a height of six feet. The lining, which was ½x6 inches 16 feet long, made by splitting common fencing with a saw, was put on the inside, beginning at the bottom. (Cut 13). The upper portions of the studs were then plumbed and held in place by pieces radiating from the post in the center and by boards sprung on the circumference of the silo. (Cut 13). To insure uniform strength throughout the silo, care must be exercised to break joints when ceiling.

Staging was carried up on the inside as fast as the ceiling. When the top of the first studs was reached, the upper studs were spiked to the sides of the lower, allowing them to lap two feet,



Cut 15.—Inside Ceiling Completed. Condition in Which the Silo Stood for Six Weeks After Filling.

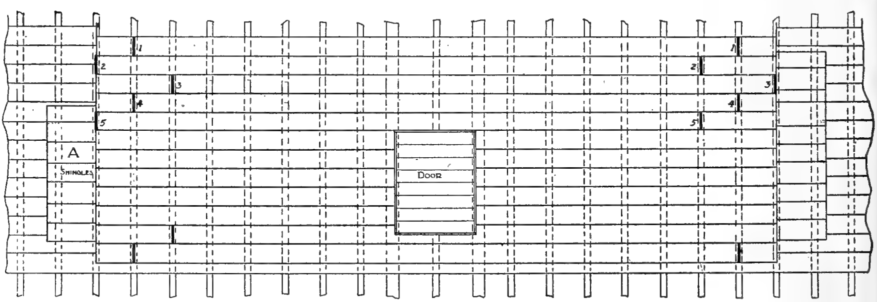
and another section was plumbed. (Cut 14). The ceiling was continued on the inside to within six inches of the top, and the plate, which consisted of 2x4's cut into two-foot lengths, was then spiked on top of the studs. (Cut 15).



Cut 16.—Showing Construction of Door and Door Frame. Joints on Inner Lining.

On each side of the line of doorways were set two 2x4's spiked together to make 4x4's. These were placed so that the edge of the 2x4's faced the doorways leaving the flat side for the doors to rest against in resisting the pressure from the silage. In this way there was no crack through the 4x4's where the plaster and doors join. (Cut 16).

As the silo was partially cut in two on the side where the openings were left, it was necessary to reinforce it between the doors. The strongest, cheapest, and most satisfactory way to do this was to ceil that side of the silo with an extra thickness from the bottom to the top, using half-inch lumber, the same as that with which the silo was lined. The doorways were, of course, left in the middle of this extra ceiling and the spaces between the doors were thus covered with two thicknesses, with no broken joints for 14 feet, as shown in Cut 17. The ends of the boards of this inner lining broke joints on three studs so that all of the strain at the end of these boards should not come at one stud. These irregular ends were filled out with short pieces so that the edge of the extra thickness would come in a straight line. Since this inner ceiling left a jog of a half inch, the thick edge of common shingles was butted against the ends of the half-inch boards, thus running the extra thickness down to a feather-edge and making an apparently even surface on which to lath. (Cut 17).

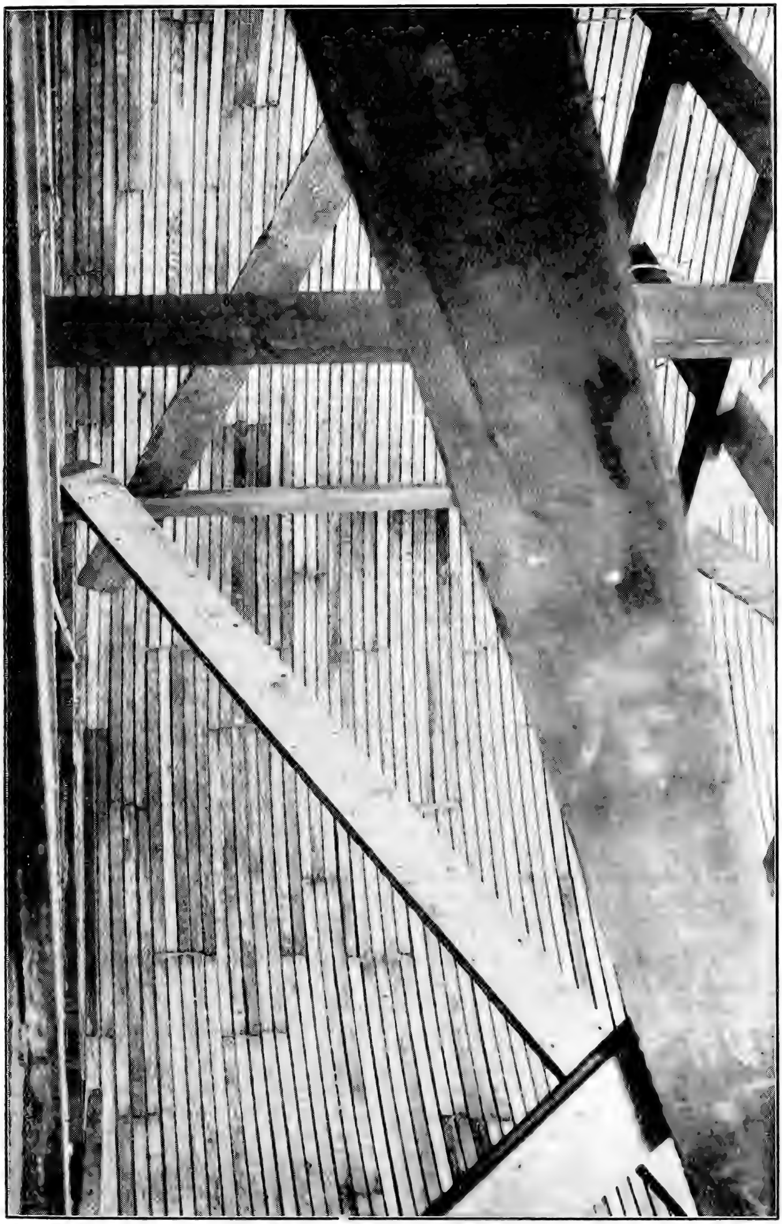


Interior before Lathing

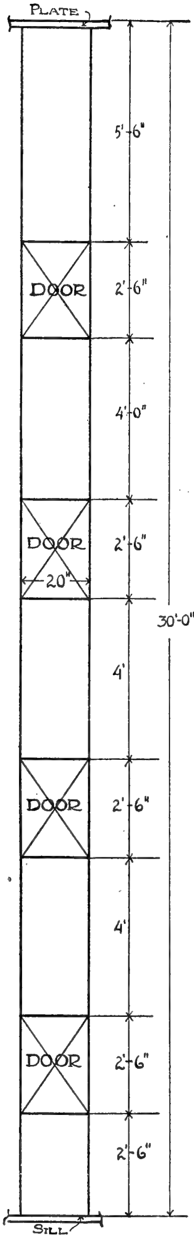
Cut 77.—Detail of Extra Lining Showing Method of Reinforcing the Side of Silo in which Doorways Were Left. Figures Indicate Ends of Boards Showing Methods of Breaking

The silo was then lathed with common four-foot lath, breaking joints as shown in Cut 18, and nailing the lath solid to the half-inch ceiling without furring out. It is usually recommended in lathing silos that the edges of the lath be cut on a bevel so that when nailed to the wall a dove-tailed joint is formed for the mortar, or that the lath be set out on furring strips so that the mortar may clinch behind the lath. Experience shows that this is entirely unnecessary.

The plaster was made of one part Portland cement to two



Cut 18.—Interior of Silo Showing Lath and Staging.



HEIGHT OF OPENINGS

parts of good sharp sand. Two coats of this mortar were used, making the plaster a full half-inch thick over the lath. The second coat extending continuously from the bottom of the brick work to the top of the silo, uniting the foundation, and the superstructure and giving an air-tight wall for the entire silo.

Four doors were made of two thicknesses of common flooring run in opposite directions, with tar paper between. These doors are each 20 inches wide, 2½ feet high, and are four feet apart. The top of the upper door is five feet below the plate, but by the time the silo is opened the silage has usually settled nearly to the top of the upper door, so that but little silage has to be removed before the door can be taken out. The size and location of the four doors are shown in Cut 19 and a section of one of them in Cut 16.

Authorities on silo construction have erroneously stated that for silos 20 feet in diameter and 30 feet deep, three thicknesses of half-inch lumber are required to give sufficient strength. This silo is 30 feet in height above the foundation, and as the pressure of silage at this depth is 330 pounds per square foot there is a tensile pull on the sides of the bottom foot of a silo of these dimensions of 3300 pounds. In this lower foot to resist this strain, there are, of course, two boards each one-half inch thick and six inches wide, making a total area of six square inches of lumber. On account of the great tensile strength of wood it was thought that this one layer of half-inch lumber would be sufficient to withstand the strain. To determine if this were true, the silo as shown in Cut 15

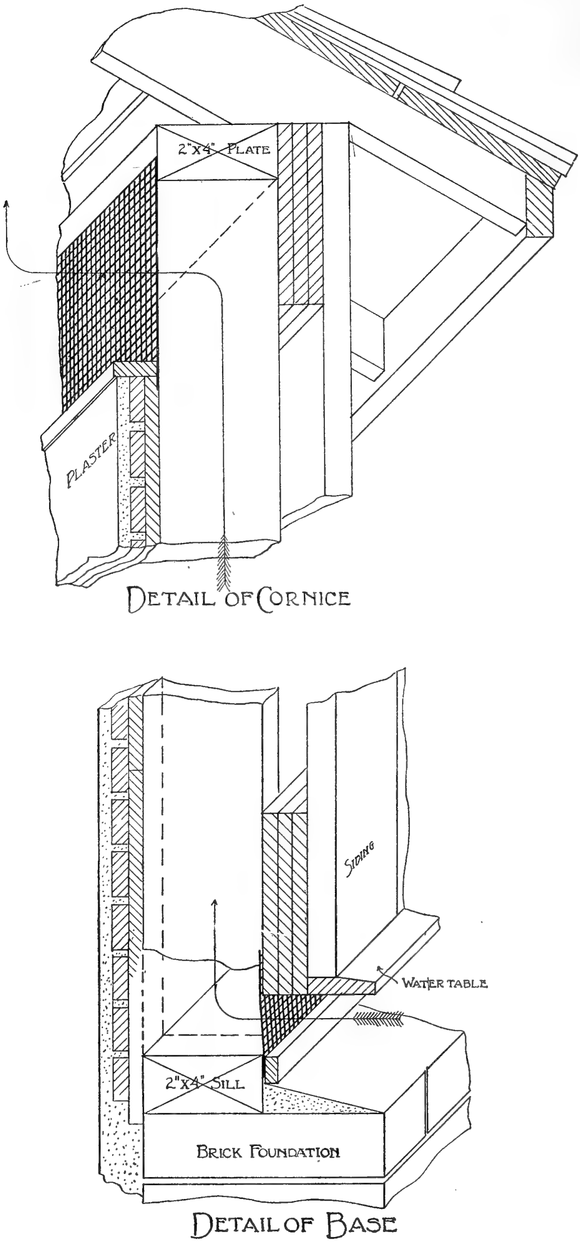
Prize Winners in Their Breeds.

was filled, and after standing six weeks did not show the slightest sign of giving in any particular.

In order to preserve the silo in good condition it is absolutely necessary that the half-inch lumber with which the silo is ceiled be protected from dampness. To this end the plaster must be of good quality and kept perfectly water-tight by cementing up any cracks that may appear, so that the wood shall receive no moisture from the silage. The wall must also be ventilated, for by allowing a free circulation of air between the sheeting and the lining, the lumber will be kept dry. In this silo a two-inch space was left at the top above the plaster and below the plate. In this way the air was allowed free access to enter from the bottom, between the outside covering and the inside lining, and pass into the silo through the openings at the top. These spaces were covered with heavy wire netting of one-third inch mesh to keep out rats an dmice. (Cut 20).

Theoretically the outside covering should be put on horizontally, so that the strength of the material which forms the cover might add to the strength of the silo. There are, however, several practical difficulties in putting sheeting on in this manner. The lumber cannot be more than a half-inch thick and spring to a circle twenty feet or less in diameter, and any siding as thin as this, which is carried in stock, is practically clear lumber and necessarily high priced. Another difficulty is that the only half-inch stuff that can be purchased at the lumber yard, which will make a water-tight cover, is common house siding. This, in order to be sprung to a circle, must be rabbeted on the back side of the thick edge so as to fit over the thin edge of the board below and allow the siding to lie flat against the studs. Rabbeted siding cannot usually be obtained at a lumber yard, and it is extra trouble and expense to have this work done at a mill. Another serious difficulty in putting the siding on horizontally is that at the end of each board there is a strong outward pull against the nail heads, and as soon as the boards become slightly decayed at the ends they are likely to pull off over the nails.

Owing to these objections and to the fact that it was our aim to use, as nearly as possible, lumber that is carried in stock by all lumber yards, it was decided to put hoops on the outside and build them up of the same half-inch material as the inside sheeting. This was done by using three thicknesses and breaking



Cut 20.—Detail at Top and Bottom of Silo Showing System of Ventilating the Wall. Openings Covered with Wire Netting to Keep Out Rats and Mice.

joints, thus making a strong six-inch hoop $1\frac{1}{2}$ inches thick. Seven of these were placed around the silo between the doors to make a continuous even surface on which to nail the sheeting. The silo was sheeted up and down with common 1x12 barn boards 14 and 16 feet long, and the cracks were covered with common three-inch battens.

Some silos are sheeted on the outside with the same half-inch lumber as is used on the inside, having the edges cut to a bevel so that the cracks slant outward and downward. The same difficulties are encountered here, however, as were mentioned above, and such siding is not perfectly water-tight, as the rain may drive in between the cracks. When the siding is put on horizontally it should be carried up as fast as the ceiling inside, thus obviating the necessity of building staging on the outside.

After the silo wall was completed a conical shingled roof was put on, a chute built over the doors through which the silage is thrown down, and the small space between the silo and the barn roofed over, connecting the two. The silo was then completed ready for painting.

The silo has been filled twice, and both years the silage has kept perfectly from the bottom to the top, even next the wall and against the doors. As before mentioned the top of the brick wall cracked, as it was not reinforced, and the silage spoiled slightly at this place, but this can easily be remedied another year.

In the spring of 1904, when the cows were turned out to pasture, about seven feet of silage remained in the silo. The small silo for summer feeding was then opened and the rotten silage from the top of the small silo was distributed over the good silage in the large silo to the depth of about six inches. This was thoroughly soaked and tramped firmly. When ready to fill again in the fall there were about eight inches of rotten silage to remove, only two inches of the good silage having spoiled. Fresh corn was run on the top of this and the whole kept perfectly. When feeding out, scarcely any trace of spoiled silage was to be found at the union of the silage of the different years.

The cost of this silo, which was 20 feet in diameter and $34\frac{1}{2}$ feet deep, holding 228 tons, was $383.00 or $1.68 per ton capacity.

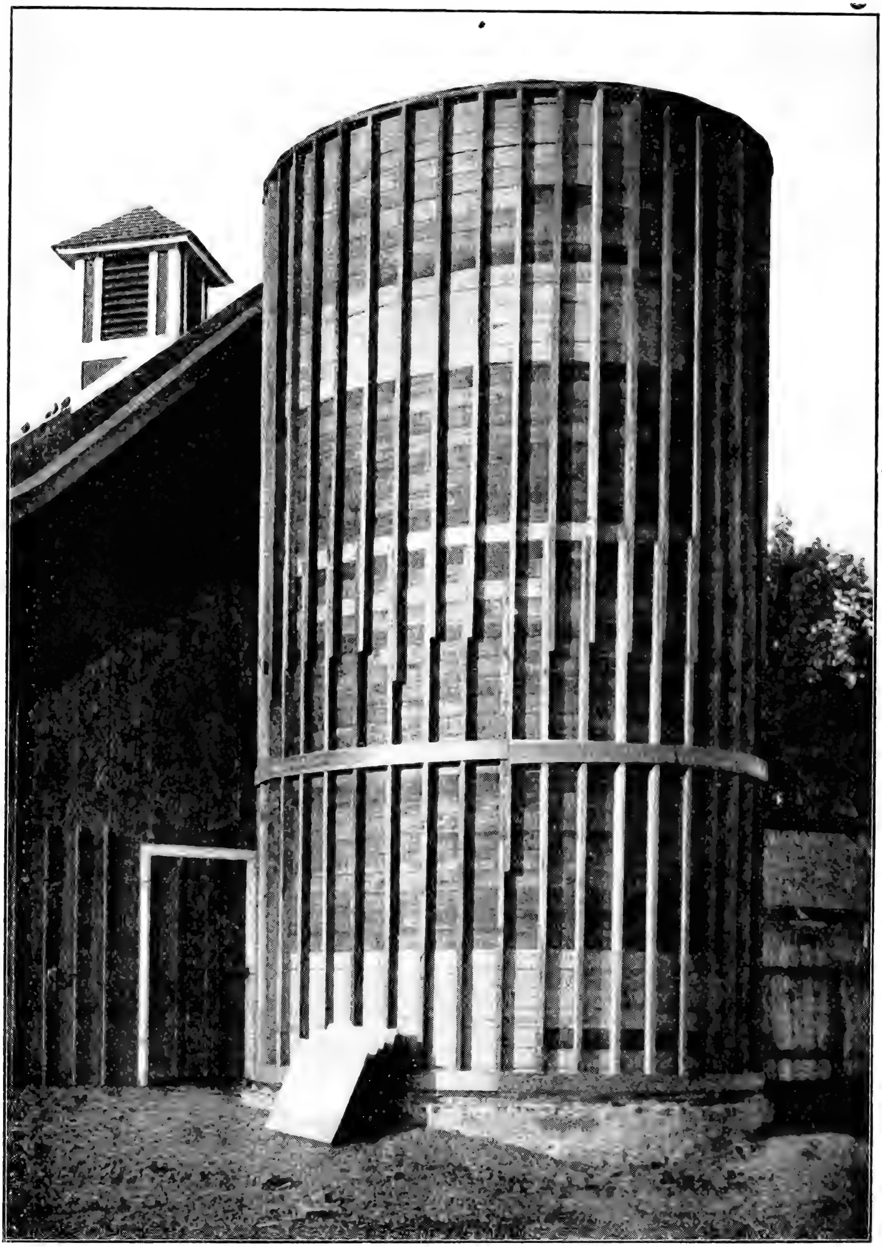
ITEMIZED COST OF SILO.

Foundation—		
Excavating 4 feet deep and laying wall		
35 hours at 30 cents	$10.50	
70 hours at 15 cents	10.50	
2,000 brick at $7.25	14.50	
2 barrels cement at $2.00	4.00	
2 barrels lime	1.55	$41.05
Superstructure—		
139—2x4—16 feet, 1,482 feet at $20.00	$29.64	
252—½x6—16 feet, 2,016 feet at $14.00	28.22	
4 doors 20x30 inches double, 33 1-3 at $23.00	.77	
3,100 lath at $4.50 per M	13.95	
11 barrels cement at $2.00	22.00	
6 yards sand at $1.25	7.50	
Carpenters, 67 hours at 30 cents	20.10	
Labor, 148 hours at 15 cents	22.20	
Plastering, 28 hours at 40 cents	11.20	
Tender, 35 hours at 15 cents	5.25	160.83
Sheeting—		
7 hoops—84—½x6—16 ft. 672 ft. at $14.00	9.41	
61—1x12—16 ft. 976 ft. at $24.00	23.42	
61—1x12—14 ft. 854 ft. at $24.00	20.50	
61 battens ½x3—16 ft. 244 ft. at $22.00	5.37	
61 battens ½x3—14 ft. 214 ft. at $22.00	4.70	
65 ft. 2½ in. water table at $3.00 per C	1.95	65.35
Roof—		
18—2x4—14 ft. 168 ft. at $19.00	3.19	
3—2x4—12 ft. 24 ft. at $19.00	.46	
4,000 shingles at $3.20 per M	12.80	
35 roof boards 1x6—16 ft. 280 ft. at $16.00	4.48	
Cornice, 5—1x12—16 ft. 80 ft. at $24.00	1.92	
Ornamental post in center	.90	23.75

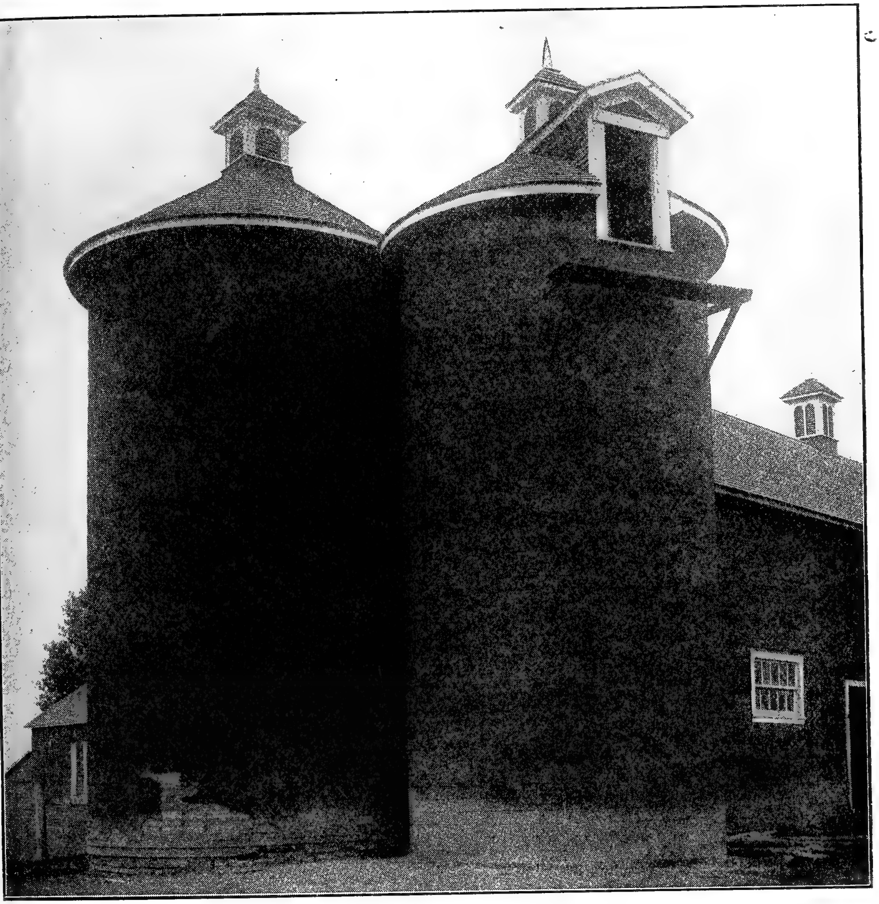
Chute—		
5—2x4—14 ft. 47 ft. at $19.00	.89	
12—1x12—16 ft. 192 ft. at $24.00	4.61	5.50
Carpenter work on roof, sheeting of silo and chute—		
54 hours at 30c.	16.20	
120 hours at 25c.	30.00	46.20
Hardware—		
Nails—		
50 lb. 8d common at 3c.	1.50	
2 lb. 10d common at 5c.	.10	
8 lb. 3d cut at 4c.	.32	
6 lb. 6d cut at 4c.	.24	
4 lb. shingle at 4c.	.16	
2 lb. long finishing at 5c.	.10	
Wire netting—		
63 sq. ft. 1-3 in. mesh at 5½c.	3.47	5.89
Painting—		
Priming coat—		
9 gal. oil at 50c.	4.50	
29 lb. yellow ocher at 5c.	1.45	
25 hours' labor at 15c.	3.75	
Paint and labor, two coats	25.00	34.70
Total cost		$383.27

Many silos are built similar to the one just described, excepting that in place of the lath and cement plaster the silo is ceiled with another thickness of half-inch lumber, using waterproof paper between. That the lining shall be tight, the boards must be of the same width and it is necessary to have the lumber dressed so that the boards will be of the same thickness and will lie closely together. This makes a fairly good silo for a few years, if built of durable wood, but it is practically as expensive and does not preserve the silage so thoroughly.

The exterior covering of this style of silo may be the same as for a plastered silo. If built inside the barn no roof or outer sheeting is necessary. In Cut 22 is shown a silo of this



Cut 22.—Silo Ceiled on the Inside with Two Thicknesses of Half-inch Lumber with Paper Between. Barn was Built Over Silo Later.

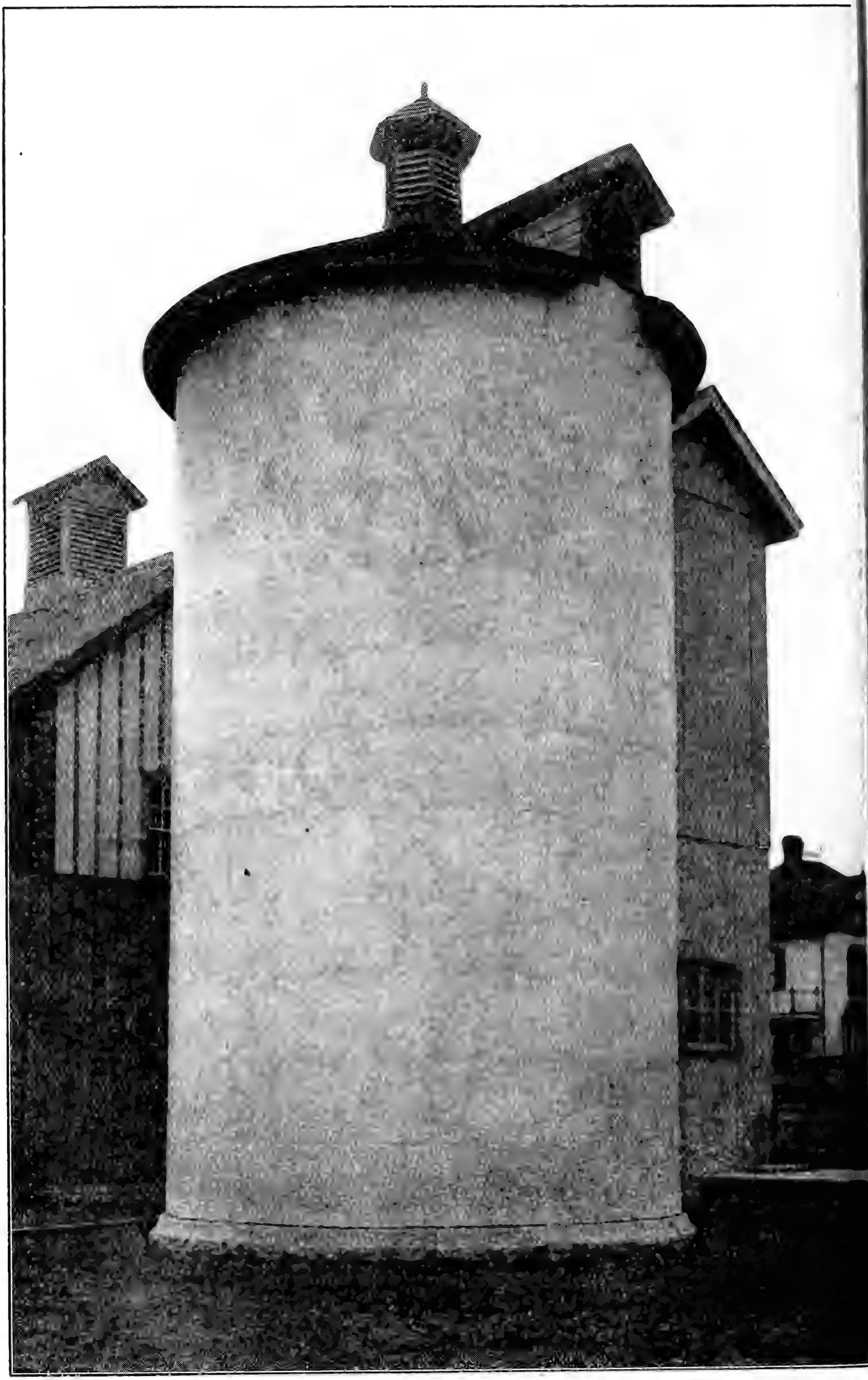


Cut 24.—Two Silos of Same Construction as Shown in Cut 22, Sheeted with Half-inch Lumber; One on left Also Covered with Tar Paper.

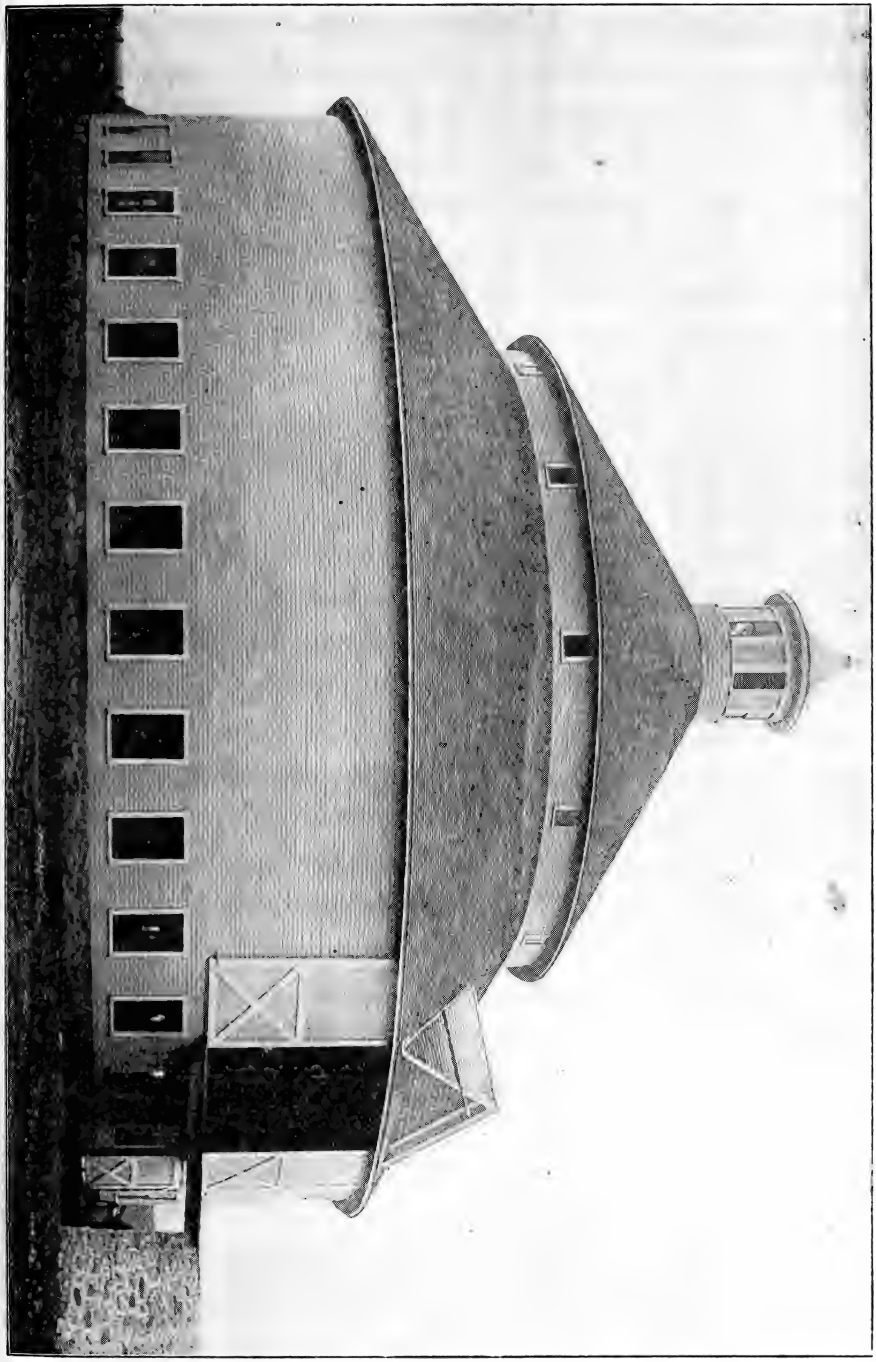
construction, where the barn is built over it. Cut 23 shows a silo of this style ceiled with beveled half-inch lumber. In Cut 24 are shown two silos of the same construction sheeted with half-inch lumber; one being covered with tarred felt.

The silo shown in Cut 25 is sheeted with half-inch lumber to a height of six feet and the entire surface is covered with galvanized iron. This makes a good covering, but it is rather expensive, as the iron costs about 5 cents a square foot.

From what we now know, the round wood silo, plastered with cement, seems to be the best construction, but the indications



Cut 25.—Same Construction as Shown in Cut 22, Sheeted with Halt-inch Lumber to a Height of Six Feet and Covered with Galvanized Iron. An Expensive Covering but Durable and Saves Painting.



are that when we learn to handle concrete to the best advantage this will be the material for building silos.

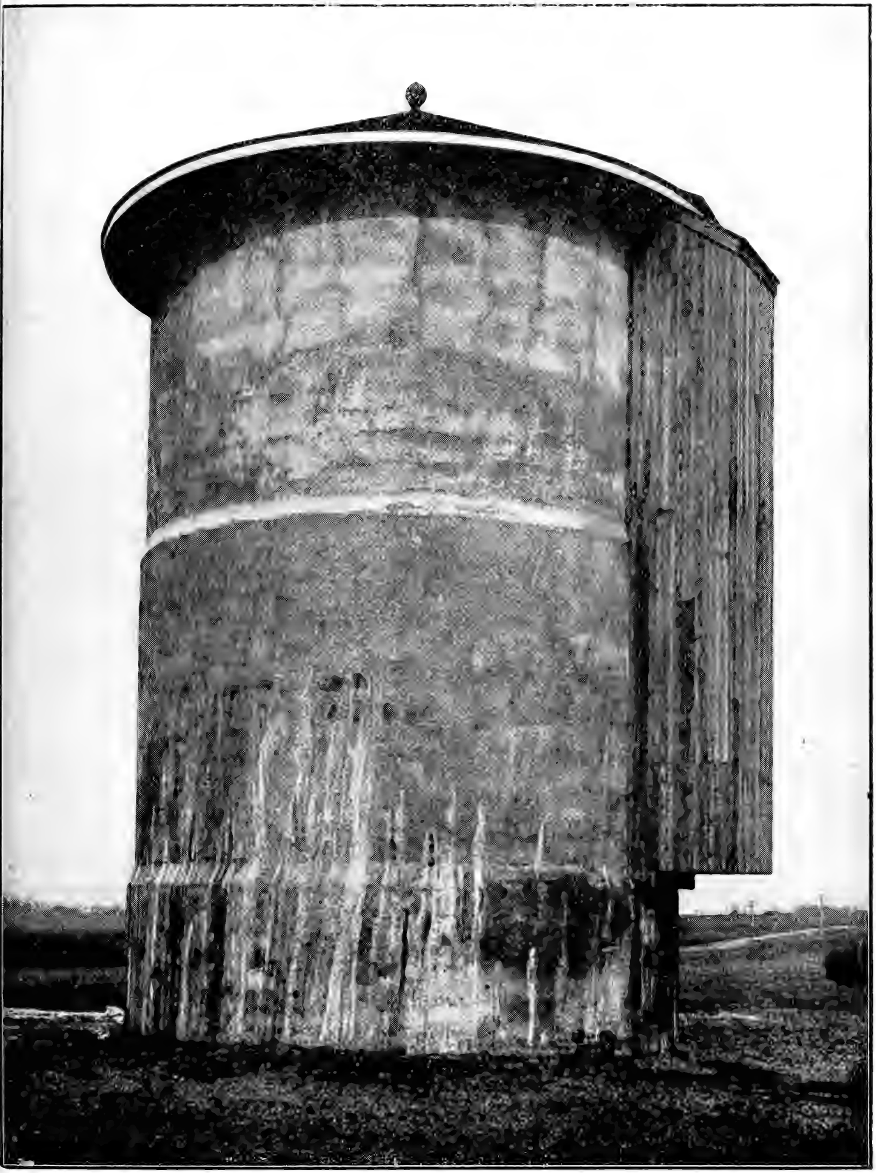
Concrete Silos.

Silos built of concrete have been 30 feet deep, with the wall not more than six inches thick at the base and tapering to four inches at the top. Where gravel or crushed stone can be obtained at a reasonable price it may be advisable to make the walls slightly thicker, and in cold climates they should be built with a dead-air space in the wall to prevent the silage from freezing. In any event there should be enough heavy wire or iron rods imbedded in the wall to withstand the strain of the silage; unless this is done cracks are likely to appear. The amount of wire necessary in each case will depend upon the size and depth of the silo. The wall should be plastered on the inside with one part of Portland cement to two of good sharp sand troweled to a smooth surface. This will resist the action of the acid in the silage.

Cut 28 shows an all-concrete silo 20 feet in diameter and 42 feet deep. The wall is 22 inches thick for the first 14 feet, 19 inches thick the next 14 feet, and 16 inches thick the upper 14 feet. This silo cost approximately $1200, and as it holds 334 tons, the cost per ton was $3.59. While the first cost of this silo was high it may prove economical in the end, as it should stand for more than a hundred years.

It is essential that a concrete, stone, or brick silo have a good foundation, otherwise it is likely to settle unevenly and cracks will appear in the wall, giving the air a chance to enter. If the silo is put at least three feet into the ground this assures a firm footing and also adds to the depth of the structure.

There are great possibilities in reinforced concrete and a circular structure is the best to be easily reinforced. Silos have been built of concrete, but usually with solid walls and much thicker than necessary. The method of construction heretofore has in most cases been cumbersome, requiring a large amount of lumber to construct the forms. With unskilled labor the question of concrete silos is still a problem. Good grades of cement are now manufactured in the state and are becoming much cheaper. Machines have already been made with which reinforced continuous hollow walls are built with comparative ease, and when we learn how to handle cement to the best advantage possible this will, undoubtedly, be the silo of the future, especially in sections where sand and gravel or crushed stone are abundant.



Cut 28.—Concrete Silo 20 Feet in Diameter and 42 Feet Deep.
Capacity 334 Tons.

We expect to investigate the subject of concrete silos during the coming year and erect one or two small ones of this construction at the University.

Brick Silos.

Where brick is cheap and stone and gravel scarce, a brick silo may be the most economical. In large brick silos the wall is usually built with three or four courses of brick at the base and made a course thinner at various heights until reaching the upper ten feet, which need not be more than eight inches thick. Cut 29 shows a brick silo built on this plan. This silo rests upon a seven-foot stone foundation 18 inches thick; six feet of it being below the ground. Upon this are laid three courses of brick, the middle course being of brick tile which contains a dead-air space, and thus prevents freezing to a great extent. This wall extends twelve feet above the foundation, and from that point to the top two courses of brick are used with one and a half inch air space between. One silo 16 feet in diameter and 30 feet deep, built in this manner, holds 120 tons and cost $250, or $2.08 per ton. Another silo of the same depth and 19 feet in diameter holds 168 tons and cost $350, or $2.08 per ton, the same as the smaller silo.

Stone Silos.

Where stone can be easily and cheaply obtained silos may be built of this material. Cut 30 shows a stone silo which is 18 feet 10 inches in diameter and 30 feet deep, holding 156 tons. The wall of this silo is two feet thick and extends five feet into the ground. The portion below the surface is made of hardheads, while that above is of quarry stone obtained from a neighboring farm. The inside is plastered with Portland cement. The first door is 2x6 feet, the next 2x3 and the upper 2x4 feet. This silo cost $500 besides the labor of the owner, which amounted to about $100, making the total cost $600, or $3.64 per ton capacity. Although the material may be cheap and close at hand, the expense of elevating heavy stone for so thick a wall, and the employment of a stone mason, which is high priced labor, make a stone silo expensive.

The silo shown in Cut 31 is 20 feet in diameter and 32 feet deep, having a capacity of 204 tons. This silo extends eight feet into the ground, which is too deep, requiring extra labor in removing the silage. The wall of the lower 12 feet is 24 inches

thick and above this it is 18 inches. The wall is plastered with a half-inch coat of cement and the bottom is covered with three inches of concrete. Iron rods were laid in the wall just above and below the doors. The stone cost $3.50 per cord and was hauled seven miles. Sixty-three loads of sand were bought at ten cents a load and hauled four miles. The total cost for material, masons and carpenter was $535, but this does not include excavating, the hauling of material, tending masons and boarding men. If all these expenses were included it would probably make the total cost about $700.

Cut 29.—Brick Silo with Dead-Air Space in Wall.

Stone silos preserve the silage perfectly and are permanent, requiring little outlay for maintenance, the only objection being the excessive first cost.

Stave Silos.

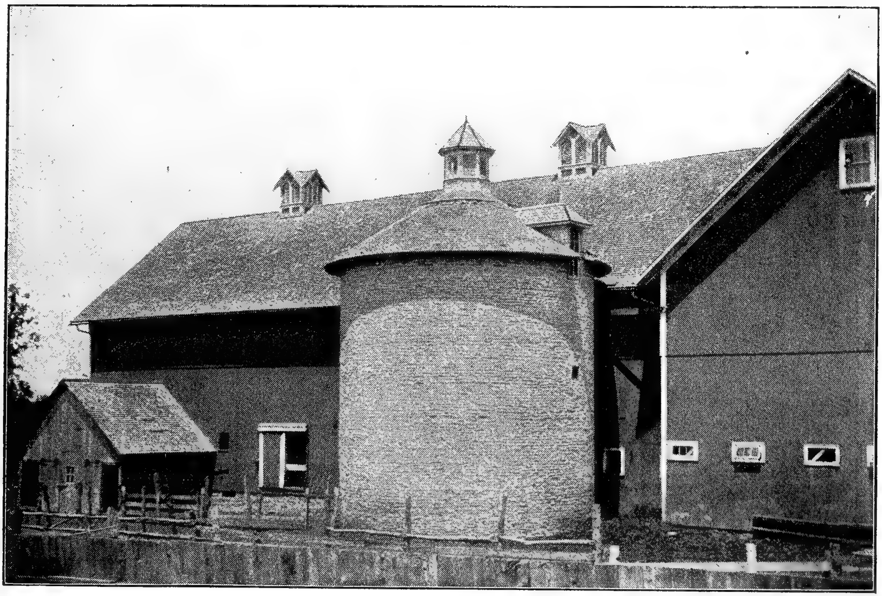
There are cases where a cheap, temporary silo may be economical and of great advantage, for example, a farmer may expect to build a new barn in a different place, and want a silo near the old barn for a few years only; or a renter may wish a temporary silo, and then if he moves in a short time he can take the lumber from a stave silo with him.

The objections to a stave silo are that the staves shrink

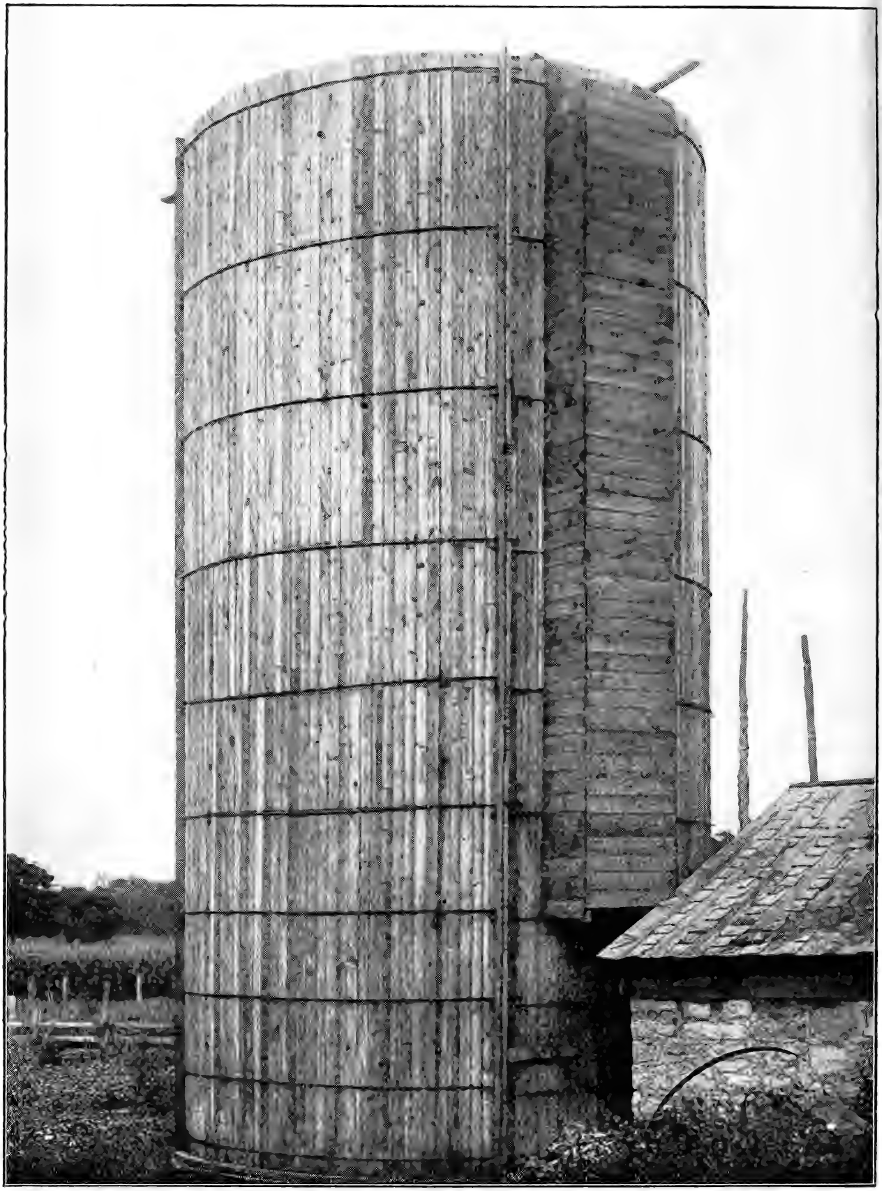
Cut 30.—Stone Silo 18 Feet 10 Inches in Diameter and 30 Feet Deep. Capacity 156 Tons. Cost About $600.

during dry weather when the silo is empty, and unless the hoops are tightened there is a possibility of the silo being racked or blown over. If the hoops are tightened when the staves are dry there is then danger of the hoops bursting when the silo is filled and the staves again become saturated with moisture. An example of this came under the writer's notice recently, when the second morning after a silo was filled the owner found half the hoops had burst. It will be noticed in the illustrations of stave silos that where they had been put up for any length of time the staves had shrunk, allowing the hoops to drop from their original position. A stave silo is usually much more satisfactory if a building is built over it for protection, but this makes it expensive.

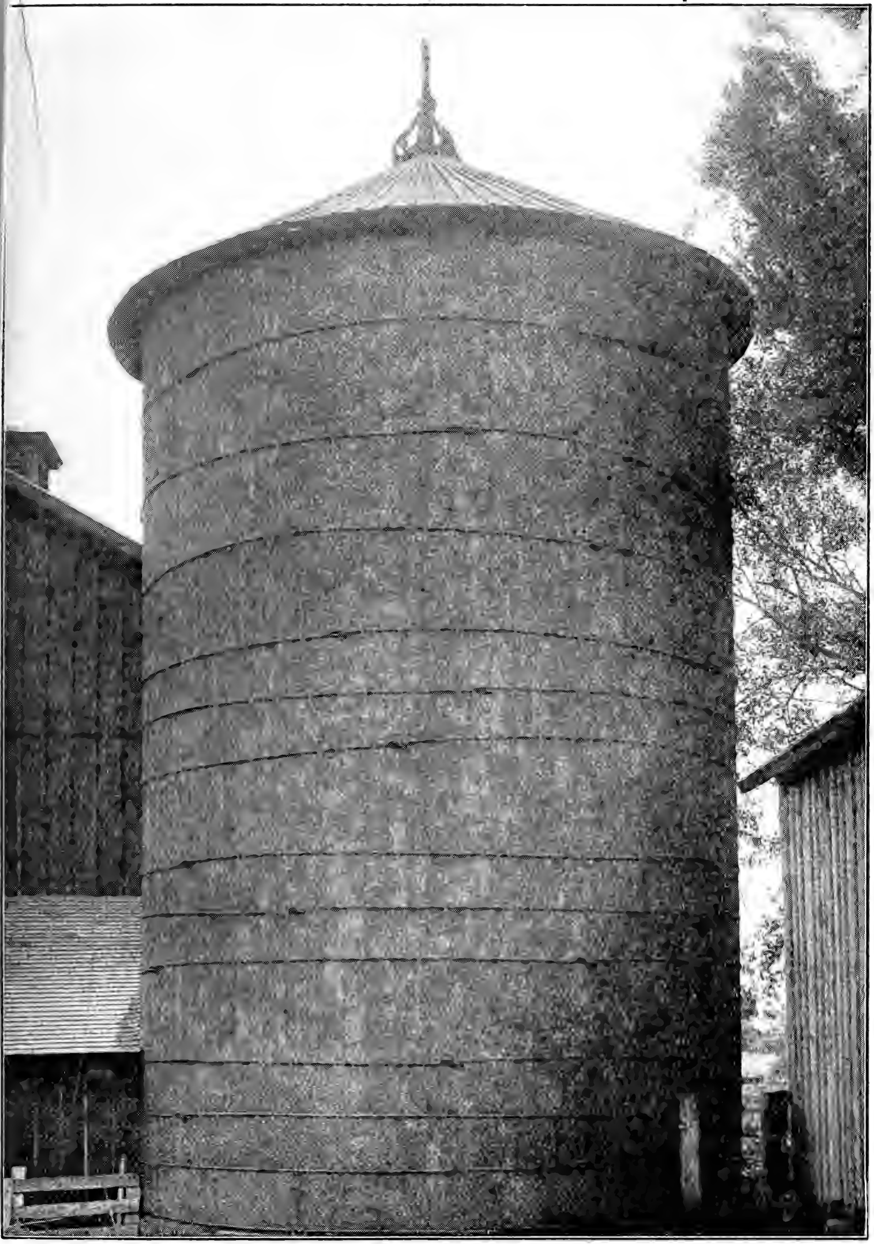
Cut 32 shows a stave silo recently built. This silo is 16 feet in diameter, 34 feet deep, and has a capacity of 150 tons. The foundation, which extends two feet into the ground, is a brick wall that was laid up by the owner. The silo was built by two carpenters in nine days, at $2.50 a day each, making $45 paid out for labor. The lumber cost $80, the iron hoops $20, and nails and spikes $2. There being no roof, the silo above the foundation



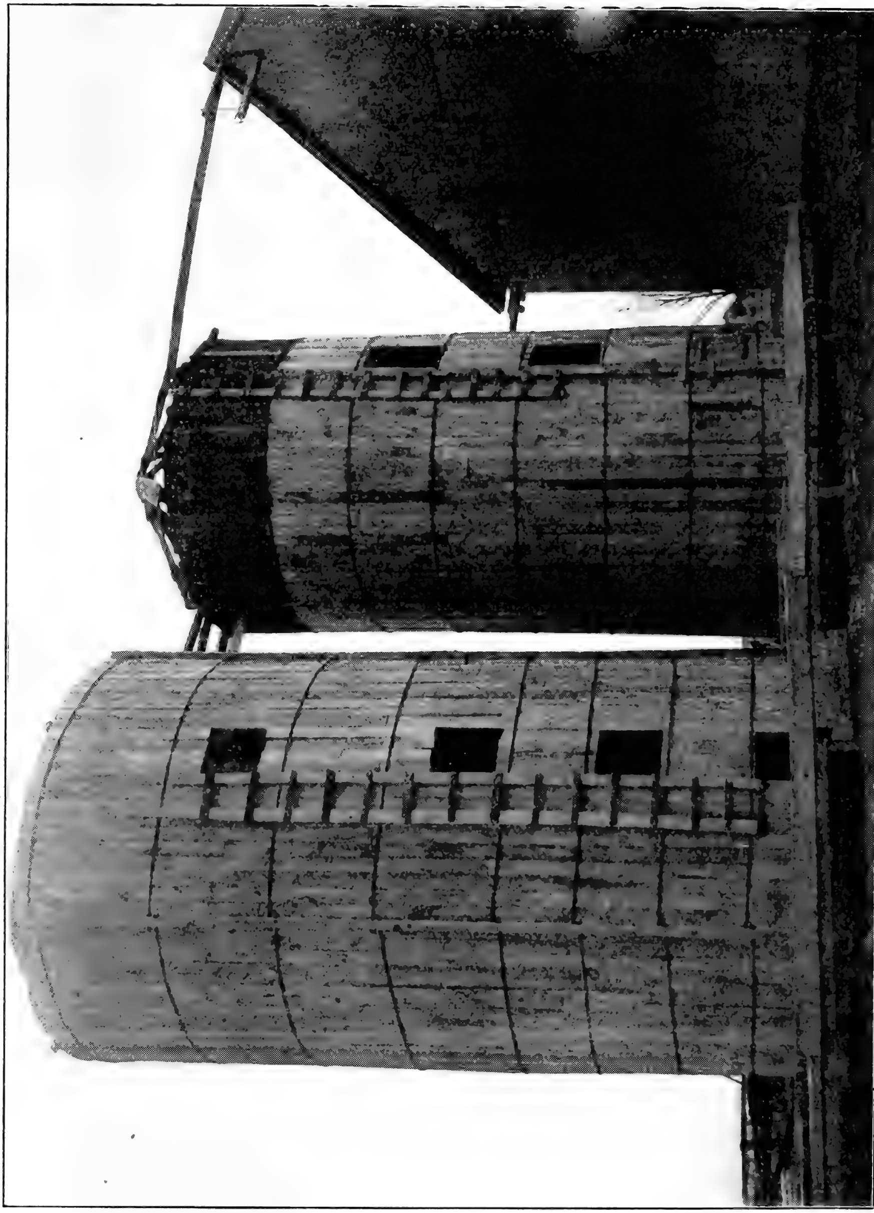
Cut 31.—Stone Silo 20 Feet in Diameter and 32 Feet Deep; Capacity 204 Tons. Cost Nearly $700.



Cut 32.—Stave Silo Without Roof, 16 Feet in Diameter and 34 Feet Deep; Capacity 150 Tons. To Be Recommended Only Where a Temporary Silo Is Desired.



Cut 33.—Stave Silo 20 Feet in Diameter and 34 Feet Deep: Capacity 224 Tons. The Staves Have Shrunk When Empty, Allowing Hoops to Drop from Original Position.



cost, including labor, $147. If the brick had been purchased and the labor of excavating for the foundation and laying the brick charged for, the total cost of the silo would have been approximately $170 without a roof, or $1.13 per ton.

The staves were rough white pine, 2x4, 14 and 18 feet long, to make the required height. Four 4x6 uprights were placed on the foundation in the circle, 90 degrees apart, holes having been bored in them to receive the iron hoops, which had threads cut on the ends. The staves were then set in the circle alternating in length, so as to break joints. As each 2x4 was set up it was fastened to the next one by means of six-inch spikes, which were driven through the 2x4's edgewise. Spiking in this way makes the silo much more rigid and it is not so likely to be racked or blown down when empty. When all the staves were in place the silo was tightened by turning up the nuts at the ends of the iron hoops on either side of the 4x6's. The hoops are much closer together at the bottom than at the top, to give the added strength necessary where the pressure is the greatest.

Four doors 18 inches wide and two feet high were cut in the side, one above the other, about six feet apart. Outside of these was built a chute to prevent the silage from being blown away when thrown down.

There are several firms who manufacture stave silos and send them out in any size desired, ready to set up. Many of these are made of durable wood and give good satisfaction. One of these silos is illustrated in Cut 33.

While it is true that a stave silo may be used to advantage in some cases, yet where a permanent silo is desired either the wood silo plastered with cement, or the grout, or brick structure will undoubtedly prove more satisfactory, both on account of greater permanency and the better preservation of the silage.

ALFALFA IN INDIANA.

By A. T. Wiancko, Agriculturist, Purdue University Station.

1.—Experiments in Late Summer Seeding.

The increasing interest in alfalfa culture among Indiana farmers and the many failures in attempts to establish the crop have brought a constant stream of inquiries to the Station concerning time and methods of seeding. The common practice was to sow the alfalfa in the spring of the year, either with or without a nurse crop of oats or barley, and it was observed that the majority of the failures were due more or less directly to the presence of large numbers of spring and summer weeds, which gradually crowded and choked the alfalfa plants to such an extent that they dwindled away to nothing as the summer advanced. It also appeared that in many cases the nurse crop was of doubtful value as a protection against weeds, and that it often did positive harm by shading the young alfalfa too much. It seemed, therefore, that the question to be answered was how to avoid both weeds and nurse crop.

The most practical solution of the problem seemed to lie in first destroying the weed seeds in the soil and then sowing the alfalfa alone. This involved late seeding in order to give time to get rid of the weeds, which could be practically done only by plowing the ground early and harrowing it every ten days or two weeks for a period of several weeks, until all the weed seeds in the surface soil were sprouted and destroyed. By this method the ground might be expected to be in good condition for seeding by the eaarly part of June, and since it is not usually advvisable to take a hay crop or pasture the field the first season, there appeared to be no serious objection to even later seeding so long as sufficient growth to thoroughly establish the plants could be secured before winter.

While this method was generally conceded to be safe and practical, two objections were urged against it, namely; the extra labor of preparing the ground for sowing and the sacrifice of a year's crop from the land. To avoid these objections, late summer seeding, after a small grain or other early harvested crop had been removed, was suggested. To determine the value of this suggestion an experiment was undertaken on the University Farm in the summer of 1905. Ground was prepared in early August and seeded to alfalfa on the 17th day of the month. This seeding was in every way satisfactory. A good stand of plants

was secured and the fall growth was sufficient to thoroughly establish the plants and they passed through the winter in good condition. It was observed, too, that weeds were not nearly so troublesome as with spring seeding on the same ground. A seeding made at the same time by Mr. Ellis House at Bicknell, Indiana, was also highly satisfactory.

After these encouraging results, it was determined in the summer of 1906 to further test the practicability of such late seeding by similar experiments in various parts of the state. A letter stating the problem and outlining the plan of the experiments was sent to about seventy-five farmers with a request for their co-operation. Arrangements for sixty-one experiments were completed about the middle of July. Five pounds of alfalfa seed to be sown on a quarter acre plot was sent to each experimenter with the understanding that he would sow it according to instructions and report the condition of the plot before winter and again in April. The instructions for soil preparation and seeding were in part as follows

"Any well drained piece of fallow or stubble ground will do for the experiment. Prepare the ground as you would for a good corn crop and do it as soon as possible. If the ground is at all hard or inclined to break up cloddy, double disk it once or twice before plowing, and again right after. Go over the plat with a harrow at intervals often enough to keep a loose mulch on top to preserve moisture for seeding. It will be necessary to be very careful in preparing the ground at this season of the year in order to get a sufficiently moist seed-bed. Sow all the alfalfa seed we shall send you on a quarter acre plat, as soon after the first of August as the moisture conditions will permit. In northern sections the seeding should in no case be delayed later than August 10, and in southern sections not later than August 25. Cover the seed with a smoothing harrow.

The tests reported were conducted on 57 different farms located in 42 different counties.

A report covering a list of questions concerning the soil, time of seeding, stand secured, whether conditions, presence of root nodules, amount of fall growth and general thriftiness of the plat was secured in November, and another report concerning winter-killing and spring condition was secured in the latter part of April. A summary of 57 such reports, covering the principal points of interest, is presented herewith:

Analysis of the Reports.

In studying the reports herein presented, it must be remembered that the experiments covered a period of only one year, and that, therefore, too much dependence should not be placed upon them. Both the conditions and the results varied very widely, and it is not safe to draw hasty conclusions. Both good and poor results were secured under almost every combination of conditions, except where standing water and ice existed; what one experimeter found to be a good thing to do another found to be useless, and all through the series we find many apparent contradictions. Just what it is that makes the difference between success and failure can hardly be determined from these reports, and it is quite evident that we shall have to look further for the real causes that produce failure. Except in the case of drouth, weeds and standing water, it does not matter which one we take of the factors on which reports were received, we find that where one man failed another succeeded It may be safe, however, to conclude that since so many succeeded, the late summer seeding in itself cannot be held responsible for the failures to any great extent. This is further borne out by the facts that the amount of fall growth made does not appear to bear any relation to the condition of the crop in the spring, and that while much winter-killing occurred in one place there was none in the next, although the two cases appear to be quite similar.

Concerning the time of seeding, the reports show that good results were secured with various dates of seeding all through the month of August. Of three seedings made in early September, two gave fair results and one poor. Out of 38 plots sown between August 7 and 15, thirty-four (90 per cent) gave satisfactory fall growth, and nineteen (56 per cent) of these were in good or fair condition at the end of April this spring. Of the 19 plots sown later than August 15, twelve (63 per cent) gave satisfactory fall growth, and ten (83 per cent) of these were in good or fair condition at the end of April this spring. These data indicate that the date limit for successful seeding has scarcely been reached in these experiments, and it seems fair to conclude that with reasonable soil and weather conditions it would be safe to delay the sowing of alfalfa as late as the middle of August, at least, especially when we remember that in the fall of 1906 the growing period was considerably curtailed by the heavy frosts in the early part of October. Sowing about the middle of August

would give from four to six weeks' time during which to prepare the seed-bed in cases where it is desired to sow alfalfa after small grain or other early harvested crops, and ordinarily it will be possible to do it satisfactorily in this time in spite of considerable dry weather which often occurs at this time of the year.

Concerning the weather conditions it may be said that the late summer and fall weather was on the whole a little better than usual as regards moisture supply, but there were some important exceptions, as may be seen in the column of remarks. (The bulletin containing this report gives reports from 57 farmers on fall and spring conditions of alfalfa sown in late summer 1906.) As regards the length of the fall growing period, the conditions were unfavorable all over the state and growth was checked considerably earlier than usual on account of the severe frosts in the early part of October. The winter and early spring were unusually severe, and judging from the effect on clover, caused considerably more damage than would have been the case under ordinary conditions.

Of the fifty-seven reports received, thirty (53 per cent) state that the fall weather was, on the whole, favorable. In the other cases (47 per cent) the fall weather was more or less unfavorable at one time or another. Of the forty-four (77 per cent) who report good stands, sixteen (36 per cent) say the fall weather was rather too dry, and in five cases very dry. Of the nine (16 per cent) who report medium stands, four (44 per cent) say the weather was too dry, two had good weather, two do not state, and the other sowed the alfalfa too thin. The four (7 per cent) who report poor stands also report very dry weather. One of these also reports sowing in standing corn.

Of the thirteen who report deterioration in the stand during the fall, six attribute it to dry weather, two to weeds and dry weather combined, one to sowing in corn, one to grasshoppers, one to a severe storm and two give no particular reason for deterioration.

While dry weather is held responsible for the majority of the failures to get a good stand or satisfactory fall growth, it appears that in a number o fcases good results were secured under very dry weather conditions.

Concerning winter-killing, the reports do not show any relation between the date of seeding and the amount of winter-

killing. There was fully as much winter-killing among the plots sown in the early part of August as among those sown around the 1st of September. The proportion of winter-killing, however, was alarmingly large and it appears that the winter and early spring weather are very important factors. It must be remembered in this connection that the past season was very unusually severe and that ordinarily very much less damage might be expected.

Out of fifty-two experimenters who reported on the spring condition, twenty-three (44 per cent) reported less than ten per cent of damage by winter killing; eleven (21 per cent) reported from ten to thirty per cent of damage, in two of which cases the damage was largely due to standing water and ice. Out of 38 plots on clay and clay loam soils reported in spring, eleven (29 per cent) showed no appreciable winter-killing, twenty-four (63 per cent) showed less than thirty per cent, and fourteen (34 per cent) showed over thirty per cent of winter-killing. Of 14 plots on sandy and sandy or gravelly loam soils reported in spring, six (43 per cent) showed no appreciable winter-killing, ten (71 per cent) showed less than thirty per cent, and four (29 per cent) showed over thirty per cent of winter-killing. It will be seen from this that while there was more or less winter-killing on all types of soils, there was relatively less on the lighter soil. The difference, however, is not very great, and some of the heaviest clay soils gave quite satisfactory results.

Concerning the effect of type of soil on the initial stand secured, the reports show that 13 pure clays all gave good or fair stands, 38 clay and clay loam soils gave twenty-eight (74 per cent) good or fair stands, and 15 sandy or sandy loam soils gave fourteen (93 per cent) good or fair stands.

The preceding crop had no appreciable effect upon the results secured, except in the case of standing corn. In 3 cases of sowing in standing corn, one gave a good stand, but it dwindled away and the failure was attributed to dry weather and excessive shading by the corn; one gave satisfactory results, and the other gave a poor stand, and that dwindled away on account of dry weather.

Concerning the effect of special fertilization, the reports show that in 12 cases where manure was used, five were in good condition in spring, six fair, and one was in poor condition. One plot where commercial fertilizer alone was used was in good condition

in spring. In 39 cases where no special fertilization was given, six were in good condition in spring, thirteen fair, and eighteen were in poor condition. This shows that special fertilization may be of considerable value in securing satisfactory results.

Concerning trouble with weeds the reports show that out of the 56 who reported, forty (71 per cent) had no trouble with weeds, fifteen (27 per cent) reported a little trouble, and one reported considerable damage to stand from weeds.

Out of fifty-one who answered the question concerning the presence of root nodules, twenty-one (41 per cent) reported that none could be found, twenty-four (47 per cent) reported some, and six (12 per cent) reported nodules present in considerable numbers. Special inoculation was tried by four of the experimenters. In one case there were no nodules found. In two cases nodules were found on both inoculated and uninoculated areas. In the fourth case all the seed was inoculated and plenty of nodules were found. These observations indicate that some special form of inoculation is probably necessary in practically one-half of the cases where alfalfa is first introduced.

The experiments of the Station will be continued this year, with some additions and variations. Full particulars concerning co-operative experiments will be furnished upon application.

II.—Suggestions for Beginners in Alfalfa Culture.

The results of our experiments in alfalfa culture up to the present time do not warrant us in making many very definite statements concerning the conditions necessary and the best methods of procedure in order to establish a satisfactory field of alfalfa. Of a few things, however, we are absolutely sure. One of these is that the land for alfalfa must be thoroughly drained, either naturally or artificially, and that all lands which are subject to overflow, or are liable to have standing water of any kind upon them at any time, are absolutely unfit for alfalfa. It has been demonstrated time and again that alfalfa cannot exist in the presence of standing water on or near the surface of the ground. The usual water level in the soil should not be higher than four feet below the surface, and on the heavier types of soils good drainage must be provided for all surplus rain water.

Soil and Fertilization.

There is a great deal of substantial evidence that goes to show that almost any type of soil, from heavy clays to sandy and

gravelly loams, will give satisfactory results with alfalfa if the drainage is good and the soil is otherwise in good crop producing condition.

Many people make the fatal mistake of expecting alfalfa to do well on soils that are not fit to properly produce any kind of a crop. Due consideration must be given to the fact that alfalfa requires large amounts of plant food. After it is thoroughly established and properly inoculated with its nitrogen gathering bacteria, alfalfa will supply itself with nitrogen from the air, but all mineral food elements must come from the soil, and as the crop is naturally a large producer, large quantities are required. Only soils that are in good crop producing condition should be used for alfalfa.

Wherever some special fertilization is desired to hasten development, stable manure is one of the best things that can be used. Numerous experiments and the experience of many farmers have shown that stable manure not only helps to insure a good stand and strong growth, but that it also greatly facilitates the inoculating process, and often special inoculation is not necessary where manure is used. From five to ten tons per acre should be applied, according to the quantity available and the probable needs of the soil. Concerning methods of applying manure, the bulk of the evidence is in favor of plowing it under, although well rotted manure may be advantageously disked into the surface. When sufficient manure is not to be had and a commercial fertilizer is to be used, a mixture containing 1 to 2 per cent of nitrogen, 6 to 8 per cent of phosphoric acid, and 6 to 8 per cent of potash, applied at the rate of three or four hundred pounds per acre, will probably give the best results.

Concerning the use of lime for alfalfa on Indiana soils, we have not yet secured sufficient data to warrant us in making any definite recommendations. In the experiments with alfalfa on the University Farm lime has been applied at different times without any apparent effect. In other sections of the state, we have been able to learn of but few cases where lime has been used for alfalfa, and in none of these has it shown any important effect.

The most satisfactory way to test the need of a soil for lime is to make a small trial application in a representative portion of the field under suspicion and watch the results. Applications of

lime should generally be made several months before the seed is sown. A good practice for spring seeding is to plow the lime under the fall before. With our present knowledge we would recommend the use of about a ton per acre of air slaked lime. Cheap lime for this purpose can be secured from almost any lime kiln, as there is always more or less waste in the form of screenings that cannot be sold as quick lime. Some kiln operators will furnish this waste lime for the cost of loading it. For use on the soil this material is as valuable as anything that can be secured, and when compared with ground limestone it is worth practically twice as much, since it furnishes practically double the amount of actual lime.

Soil Preparation and Seeding.

Alfalfa cannot be successfully established on ground that is infested with weed seeds. This is another of the things of which we are absolutely sure. Young alfalfa is very sensitive to the presence of weeds, and there are very few cases where it will not be crowded down and out sooner or later if weeds are permitted to grow, and they surely will grow if there are any live seeds near the surface of the ground. Trouble with weeds, especially in spring seeding, has been the most potent cause of failure to secure satisfactory results with alfalfa in Indiana. Few people realize how full of weed seeds the ground really is, even where careful cultivation has been the rule. A corn field, for example, may be perfectly free of weeds in the fall after a season of careful cultivation, but next spring, when the ground is either plowed or deeply stirred up to properly prepare it for the next crop, a fresh lot of weed seeds is brought near the surface. With most crops these might not be particularly noticed, but if alfalfa is sown they are bound to get in its way. The common Foxtail is by far the most troublesome weed that we have to deal with in this connection. A number of other grasslike weeds, such as "crab grass" and "tickle grass," are also frequently heard of as troublesome to young alfalfa. There is only one way to escape from trouble of this kind, and that is by destroying the weeds before sowing the alfalfa. This may be done at any time during the spring or summer by harrowing the ground every week or ten days for a period of a month or six weeks after it has been plowed and otherwise fully prepared for the alfalfa. A longer period of time is necessary for this weed killing process in the

spring than later in the season, because germination is slower in the colder soil, and the weed seeds must be thoroughly sprouted before harrowing will destroy them.

A few years ago most of our people who pretended to know anything about alfalfa seeding, recommended the use of a nurse crop to keep down weeds, but many recent experiences have shown that the nurse crop idea is wrong. The nurse crop is more or less of a weed in itself, and both weeds and nurse crop must be avoided by a period of clean culture before sowing the alfalfa.

At present we feel safest in recommending that soil preparation for alfalfa seeding be begun in the spring of the year rather than in midsummer, because of the greater certainty of securing the right kind of a seed-bed at that time. If the soil is one of the heavier types, it should be double disked (lapping one-half) before plowing. If the ground has been fall plowed it may be prepared in spring by thorough disking. After thorough preparation, however accomplished, the seed-bed must be harrowed at least three or four times at intervals of about ten days, to sprout and kill weed seeds, until some time in June or July, according to the character of the season. The alfalfa seed should then be sown alone at the rate of twenty pounds per acre. It may be broadcasted and lightly covered with a smoothing harrow, or it may be drilled with a wheat drill, if the drill is of a kind that can be adjusted to sow the desired amount of seed and set to cover the seed at a reasonable depth. In a loose soil and a dry season the seed may be covered deeper than in a heavy soil and a wet season. Ordinarily covering an inch deep will be satisfactory.

While the method described above gives the greatest assurance of success, the experiments herein reported, and a few experiments and observations in previous years, indicate that it is possible to get a satisfactory stand of alfalfa on ground that is not prepared for sowing until after wheat, clover or other early harvested crop has been removed from the ground, especially with favorable summer and fall weather. The greatest objection to this practice lies in the fact that there may not be sufficient moisture to properly prepare the ground and get a sufficient fall growth to thoroughly establish the plants. It seems, however, that wherever it is important to avoid the loss of a year's crop, and where the soil is in good condition, this method may be em-

ployed with reasonable chances of success. One point must always be kept in mind, no matter which method is employed, and that is that sufficient time and labor must be given to soil preparation to rid the surface of all weed seeds.

In counting the cost of establishing an alfalfa field, we should always take into account the fact that this one soil preparation and seeding, if properly accomplished, will be good for many years. If the soil is in poor condition and the stand imperfect, there will be just so much of a loss every year that the crop occupies the ground. Alfalfa should always be put in a place where it can be left for at least five or six years. It does not attain its best development until about three years old, and it may be kept in good condition almost indefinitely .

Inoculation.

Concerning soil inoculation for alfalfa, we can only say at the present time that it seems to be necessary in about half of the cases where the crop is first introduced. It is quite probable that the spread of alfalfa culture in the state is already having some effect in lessening the need of artificial inoculation. The experiments reported in this bulletin show that in many cases nodules developed without special inoculation, and many similar cases have come to our notice in the last two years. It has often been observed that where manure is applied the need of especial inoculation may be avoided. The so-called pure cultures of bacteria for inoculation have not produced noticeable results in a single instance where we have tried them.

Wherever inoculation is considered necessary, we would advise the use of soil from a good alfalfa field where the bacteria are known to exist. At least one or two hundred pounds of clean soil should be used per acre, and if at all possible it should be incorporated with the seed.

The Experiment Station has neither soil nor other inoculating material for sale.

Clipping.

The information we have concerning the clipping of alfalfa during the first season is too contradictory to permit of making any general rule. It seems, however, that clipping has sometimes been overdone and that young alfalfa should rather be allowed to grow undisturbed so long as it is doing well and does not bloom. With early seeding, one clipping in the latter part of

August will generally be advisable. Otherwise clipping should only be practiced when the growth seems checked, or the tops of the plants turn yellow. If not too heavy the cut materially should be left on the ground to act as a mulch. All growth after the middle of September should be allowed to die down naturally for protection to the roots over winter.

Cutting for Hay.

When alfalfa is used for hay-making it should be mowed whenever about one-tenth of it has come into bloom, regardless of size. In ordinary seasons this will be about the end of May, the first of July and the early part of August, and a good field will often yield four cuttings.

The general treatment in curing the hay is the same as that for clover, but great care must be exercised in handling it to avoid breaking off and losing the leaves, which dry quickly and are then very brittle.

Pasturing.

Alfalfa should never be pastured the first season, and in many cases it will be best to use it for mowing during the second season, in order that it may become thoroughly established before animals are allowed to tramp over it. It should never be pastured closely, as close pasturing injures the crowns of the plants. Horses and sheep are more likely to do damage in this way than are cattle or hogs. Alfalfa makes excellent pasture for all kinds of live stock, and it is especially desirable for hogs during hot weather. With cattle and sheep care must be exercised to avoid bloating. At first the animals should be turned in for only a short time each day until they become accustomed to it, and when the alfalfa is wet, as after a rain, there is still greater need of care. It is wise to be a little more careful than with clover.

Additional Notes.

Alfalfa is used to feed all kinds of farm live stock, from chickens to horses.

It will yield from 3 to 6 tons of excellent hay per acre per season, according to the fertility of the soil.

It is rich in flesh forming nutrients and is excellent for feeding with corn or other starchy foods.

It is more digestible than red clover and is not far behind wheat bran in feeding value.

It is an excellent soil renovator, gathering nitrogen from the air, opening up the soil and bringing large quantities of mineral food from the subsoil.

The little information that we have upon the subject indicates that alfalfa should not be used as a seed crop in Indiana, except perhaps in the last season before plowing it up. Seed production weakens the plants and reduces the stand, and the seed crop produced will seldom be a profitable one.

COWPEA EXPERIMENTS.

By C. L. Newman, Arkansas Experiment Station.

Cowpeas are being grown considerably in Illinois, particularly in the southern part, and their cultivation as a forage rich in protein is being urged by the University of Illinois. In view of this fact we are giving the following bulletin:

Since the publication of Bulletin No. 70 (Cowpea Experiments, letters have been received from eighteen states and two territories making inquiries concerning this important crop. A majority of these letters of inquiry related to varieties and sources from which seed may be procured. It is probable that 40 per cent of the letters from this State reaching the office of the Agriculturist since Bulletin No. 70 was mailed, have sought information of one kind or another relating to cowpeas. A review of these letters of inquiry gives a good idea of the nature of the information sought by the farmers of the State. The object of the Bulletin is, as far as possible, to supply this information, and in addition to report such experiments as have matured or that are deemed advisable to publish at the present time.

In 1902 more than 350 plots were grown on the Station grounds, and 54 of these were planted in spots, selections and crosses, some of which are quite promising.

Rainfall from 1898 to 1902, Inclusive.

The cowpea seems to be less affected by either drouth or excessive rainfall than any other crop grown at the Experimental Station. In fact, the effects of excess of rain has invariably caused a decrease in the yield of grain and a deficient rainfall a marked increase in grain. The following table gives the rainfall for five years, omitting November and December of each year, and the average yield per acre of shelled peas and of hay:

Month.	1898	1899	1900	1901	1902
January	4.62	3.34	1.35	1.05	1.01
February	0.73	1.13	2.75	1.16	1.81
March	15.07	1.21	1.04	3.88	5.10
April	3.93	2.77	3.39	4.32	3.70
May	10.42	7.56	4.26	1.26	4.33
June	5.69	3.59	3.94	1.89	6.52
July	7.10	7.40	2.22	1.50	0.37
August	4.80	1.97	4.14	3.95	5.19
September	4.53	0.78	4.98	0.50	4.29
October	5.34	6.57	4.64	2.64	4.84
Total	62.23	36.32	32.67	22.15	37.16
	1898	1899	1900	1901	1902
Hay per acre in pounds	3,268	3,054	2,781	3,873	3,042
Peas per acre in bushels	12.3	13.7	21.3	28.4	13.4

An inspection of the above table will show that the yield of peas was greatest in 1900 and 1901, the two years with the least rain, and that in 1898, 1899 and 1902, the years of greatest rainfall gave the lowest yields, and very near one-half that of 1900 and 1901. Several correspondents have reported the same observation. The table containing the yields of peas and hay embraces the average yields of ten varieties that have been grown for the five years named, and the results are construed as conclusive evidence of the value of the cowpea as a drouth resistant crop. The highest average yield of hay was also recorded on the year of least rainfall. The yield of hay is, however, less affected by rainfall than the yield of peas. It is probable that this falling off in the yield of peas is duue to a large extent to mildew, a disease to which the cowpea is to a high degree susceptible in damp weather. In 1901, when the rainfall was most deficient, there was but slight damage done by this disease. In 1902, when the rains of August, September and October were accompanied by an unusual amount of cloudy weather, mildew was prevalent to a great extent, and many of the pea blossoms fell off before they opened. With some varieties it was estimated that fully nine-tenths of the blossoms failed to set pods, while some pods that formed were destroyed by mildew before they reached maturity.

Preparation of Soil and Planting.

It is usually the custom in many sections of the South to give very sorry preparation to soil intended for cowpeas. The writer's experience seems to lead to the conclusion that the cowpea will respond as profitably to good preparation as will corn, cotton or potatoes, and cultivation has been profitable in proportion to its

Prize Winners in Their Breeds.

thoroughness and frequency, usually resulting in 50 per cent increase in the yield of peas and a profitable increase in hay. Cultivation before the plants blossom is of far greater benefit than later.

Until the last few years the great bulk of the pea crop was planted in corn and usually between the rows and after the last cultivation. Some were planted earlier in the corn rows and covered with the hoe when the corn was hoed the last time, one man being able to plant from one to three acres per day, the area planted depending upon the weediness of the corn field at the time of planting.

This plan of planting cowpeas in corn cannot be too highy recommended, the cowpea crop not infrequently being equal to from one-half to the full value of the corn crop (see Bulletin No. 70, p. 104), while the cost of the crop of peas thus grown need not be greater than the cost of the seed and the cost of planting them, all of which should not exceed one dollar per acre. Cowpeas sown in corn should be grazed, after the corn has been harvested, first by hogs, and later by horses, cattle or sheep. This plan saves the cost of cutting, curing (often a risky undertaking), and housing the hay, and the subsequent labor of handling in feeding, while practically all the fertilizing value of the vines, except that utilized by the animal in its increase of weight, remains on the soil for the benefit of the next crop and the permanent improvement of the land. (See Bulletins Nos. 58, 62, 66 and 68.)

As the value of the cowpea becomes appreciated it is found that it is readily adjustable to any system of rotation, and in 1902 the area sown in Arkansas was commensurate with the available supply of seed, notwithstanding the fact that the price of seed was higher than ever before.

In the southern portions of the State cowpeas may be planted from the first of April to the middle or latter part of August. In the northern part of the State they can rarely be planted before the first of May or later than the middle of August. This gives in the southern portions of the State four and a half months open to planting and three and a half in the northern portion. Thus the cowpea may follow the crops that mature in the spring or early summer, may precede those that are sown in the fall, and may be sown with or in several crops that occupy the soil from April or

May, until August, September or October. If planting is done after July 1, due consideration must be given the variety planted, since the period of ripening varies between 60 and 200 days in different varieties. Some varieties have repeatedly failed to produce seed at Fayetteville when planted early in May or later. For late planting the following varieties may be depended upon in the order named: New Ear, Warren's New Hybrid, Warren's Extra Early, Old Mans, Extra Early Black Eye and Whippoorwill.

Cowpeas are now to an extent greater than ever before planted as a main crop, or second crop, for either shelled peas, hay, pasturage, cover crop, or fertilizer, or for two or three of the above purposes. Planted at whatever time, thorough preparation is insisted upon. The soil should be well broken and harrowed until well fined. If rolled and an additional harrowing be given the results will be all the better. The most convenient and at the same time most profitable place in rotation that may be given the cowpea is as a second crop following wheat, oats, rye, barley, Irish potatoes, crimson clover, vetch, truck crops, or any crop that is harvested in May, June or July. If early varieties are then planted they may be harvested or pastured in time to seed the same land to any of the above crops (except Irish potatoes), while for the second crop of Irish potatoes an early variety of cowpeas sown in May or not later than the middle of June, affords the best preparation for planting the potatoes early in August. In such a case the peas should be converted into hay, and the ground immediately prepared for the second crop potatoes. In addition to the value of the grain and hay secured from cowpeas grown after grain harvested in the spring and before grain seeded in the fall, there is an increase in the value of the subsequent crop of grain not greater than the cost of the crop of cowpeas. (See Bulletins Nos. 62 and 66.)

Of the various methods employed in planting cowpeas for grain, none have given so good results as planting with ordinary corn planters and in rows from 2½ to 3½ feet apart, 3 feet being preferred. For hay, the grain drill, with every other tube plugged, has been the most economical of seed and time, and leaves the surface of the soil in best condition for harvesting with the mower. All but two or three of the tubes of the grain drill may be plugged, thus planting two or three rows at once, and the planting done more rapidly than with a single row corn planter. Thus planted,

the cultivation may be done either with double shovel, heel sweep or cultivator. In the southern portion of the State, where corn rows are at times five feet apart, it is preferable to plant the peas with corn planter, half way between the rows of corn after the next to the last cultivation, since the space between the rows of corn and peas will admit of cultivation after the peas have begun to grow. It is not advisable to plant the climbing varieties in corn if the land is rich, since the dense growth of pea vines will overrun, interfere with gathering and possibly injure the corn. On such land the bunch varieties should be planted. Cowpeas may also be planted between rows of sorghum as suggested for corn. If the sorghum is planted early and early maturing varieties of cowpeas seeded when the sorghum is given the last cultivation, the cowpeas will make a profitable growth after the sorghum is harvested in September.

The depth to which cowpeas should be planted varies with the season of the year and the condition of the soil as regards moisture. A large majority of the varieties of cowpeas will rot in the ground if planted before the soil has become warm in the spring and the early plantings should be as shallow as possible if the soil has in it sufficient moisture to sprout them. As the season advances they should be planted deeper, but not deeper than three inches. If a hard, baking rain should fall after the seed are planted and before they have come up, the soil should be stirred, preferably with a weeder or harrow. After comparing many tests of drilled and broadcasted cowpeas the practice of broadcasting has been abandoned, except in special cases. Drilled cowpeas have always produced more grain than broadcasted, and more hay, except in abnormally wet seasons. One-fifth or one-fourth of a bushel of seed *drilled* has usually given a heavier yield of vines and from two to five times as many bushels of peas per acre as any amount of seed sown up to three bushels per acre *broadcast*. In 1900, one peck of Whippoorwill peas gave 3314 pounds of hay and 31.4 bushels of peas per acre, while 8 pecks of seed gave only 1747 pounds of hay and 16.4 bushels of peas. The two plots were treated alike in every respect, excepting the quantity of seed sown, and no difference could be detected in the fertility of the two plots. (See pp. 100 and 101, Bulletin No. 70.) In 1901, 12.5 pounds of seed per acre yielded 2675 pounds of hay per acre and 36.17 bushels of peas per acre, while 100 pounds of

seed under identical circumstances gave only 2275 pounds of hay and 19.66 bushels of peas per acre. There was not only a waste of seed in both years' trials, but the large quantity gave a reduced yield equal in some cases to very near half that produced by the smaller quantity of seed. In these two tests the larger quantity of seed was eight times greater than the smaller.

Cultivation.

In the Southern States cowpeas usually produce profitable crops upon the poorest soil and with the most indifferent cultivation or none at all. This fact has led many growers to neglect their cultivation, and the prevailing custom of sowing broadcast usually prohibits it. In the cotton section a person cannot go further in expressing the extremest degree of a soil's infertility than by saying "it is too poor to grow cowpeas." That they will grow in any soil, and with so little care and attention emphasizes the value of this crop, and at the same time interferes with its being given the cultural attention it deserves. While good preparation is half the battle in the culture of any crop, a large portion of its benefits is lost if not supplemented by cultivation, if the nature of the crop admits of it. In a number of tests on the Station grounds, cultivation has never failed to give a profitable increase in the yield of hay, while the increase in the yield of peas has invariably exceeded 50 per cent, and in several cases been more than 100 per cent greater than secured from uncultivated areas. The best and the most economical cultivation, while the crop is in its early stages of growth, is secured by the use of the weeder. This valuable implement must be used when the weeds are quite young, or it will not destroy them. It is to prevent the growth of weeds rather than destroy them after they have gained headway. The destruction of weeds is but a secondary object of cultivation. The greatest benefits are in the improvement of the physical condition of the soil, encouraging aeration, nitrification and the conservation of moisture. The weeder accomplishes these if its use is begun early and repeated frequently. The heel-sweep, the double-shovel and the cultivator are among the best tools for cultivating drilled cowpeas. The weeder may be used to advantage on both broadcast and drilled peas from the time they are planted until the fourth or sixth week of their growth, when cultivation should cease with those broadcasted, but continued by the use of the heel-sweep, cultivator or double-shovel in the drills.

When proper rotation and cultivation are practiced in the culture of cow-peas, there are but few weeds to contend with. The cow-pea, in common with other leguminous plants, possesses the power of utilizing atmospheric nitrogen in its growth. The stirring of the soil by cultivation encourages the circulation of soil air and presents conditions more favorable for the development of nitrifying organisms without detracting from the more apparent benefits of cultivation.

Fertilizing Cowpeas.

On account of the fertilizing value of the cowpea and the fact that it gives proportionately better returns from poor soil than probably any other crop, it is usually considered unprofitable to apply to it either commercial fertilizers or other manures. That the affects of nitrogen, phosphoric acid and potash alone and in combination might be noted, several plots of Whippoorwill peas were sown upon light sandy soil in May, 1900, and the yield of peas and hay determined. The soil was occupied by rye from September, 1899, to April, 1900, and the rye was plowed in three weeks before the peas were drilled in 3½-foot rows. Frequent shallow cultivation was given until the vines interfered with the passage of the cultivator between the rows. The following table gives the result:

		1901		1902	
No. Plot.	Description of Plot.	Bushels of Peas per Acre	Yield of Hay per Acre in Pounds.	Bushels of Peas per Acre.	Pounds of Hay ped Acre.
1	No Manure	27.5	2341	21.1	2462
2	50 pounds Muriate of Potash	31.4	2689	25.6	2977
3	200 pounds Acid Phosphate	32.7	3140	32.1	3269
4	75 pounds Nitrate of Soda	25.9	2594	22.6	2552
5	50 pounds Muriate of Potash 200 pounds Acid Phosphate	36.4	3784	34.7	3974
6	No Manure	24.3	2481	22.6	2394
7	200 pounds Acid Phosphate 75 pounds Nitrate of Soda	30.4	3705	35.1	4009
8	75 pounds Nitrate of Soda 50 pounds Muriate of Potash	31.6	3441	29.4	3842
9	No Manure	27.8	2224	19.4	2261
10	50 pounds Muriate of Potash 200 pounds Acid Phosphate 75 pounds Nitrate of Soda	35.9	3878	26.6	4288

These fertilizer tests very clearly indicate that applications of nitrogen do not benefit the cowpeas on the Station soil. The three unfertilized plots produced .63 of a bushel more of peas than the nitrate of soda plot (No. 4), and the nitrate of soda only added 245 pounds of hay to the yield as compared with no manure. Wherever phosphoric acid or potash were used, whether in combination or alone, there was quite a substantial increase in both pea and hay. Phosphoric acid (Plot 3) increased the yield of peas and hay 26.2 and 21.0 per cent over nitrate of soda (Plot 4).; and muriate of potash (Plot 2) gave 21.2 per cent increase in peas, but only 3.1 per cent increase in hay over nitrate of soda (Plot 4). Phosphoric acid and muriate of potash combined gave 40.5 per cent increase in peas and 45.8 per cent increase in hay over nitrate of soda. Muriate of potash and phosphoric acid combined gave a few more peas and a few less vines than where nitrate of soda was added to these two fertilizers.

For two or three weeks after the peas had germinated the plots to which nitrate of soda had been applied appeared to have a deeper color, and to be in more vigorous growth, than any of the plots not receiving nitrate of soda. After the third week it was evident that the plots with mineral fertilizers were in more vigorous growth, and the difference in their favor was marked throughout the remainder of the season. The young pea plants utilized the nitrogen of the readily soluble nitrate of soda before the development of the nitro-gathering tubercles, and, their early growth was thus stimulated, but not to an extent to show in the final yield except in a very slight increase in vines, which was not sufficient to compensate for the cost of the nitrate of soda applied. If cowpeas are to be used for the purpose of restoring impoverished lands the application of phosphoric acid and potash would usually result in profitable returns from the cowpeas and always to the crop following the cowpeas. The application of phosphoric acid and potash to a crop of cowpeas grown for fertilizing a truck crop that is to follow cowpeas will probably give better returns than when the application of the mineral fertilizers is made directly to the crop it is intended for.

The Fertilizing Value of Cowpeas.

In the South cowpeas are grown for four purposes: Grain, hay, pasture and fertilizer. Usually the first three are primary

or immediate objects and results of their culture, and the last secondary or incidental. Grown for whatever purpose, they reward the planter by increasing the productive capacity of his soil, and are fertilizers wherever and whenever grown in appropriate rotation. Throughout the civilized world legumes are grown for the purpose of increasing the fertility of soils. These legumes are usually slow to develop, and as a rule occupy the soil one or more years before the greatest good results. They must be sown in early spring or in the fall, and are not so well adjusted to the requirements of southern systems of rotation, and are particularly unsuited for rapid rotation with grain crops. The cowpea possesses all the good qualities of these other legumes to a maximum degree and develops them in a minimum of time. With the exception of the velvet bean, the cowpea is of more rapid growth than other cultivated legumes, and assimilates the greatest amount of plant food in the shortest time. This apparent superiority of the velvet bean does not hold in practice, since it does not mature seed in this State in sufficient quantity to avoid the purchase of a new supply for each crop, and the tangled vines usually prohibit their being harvested for hay or plowed into the soil in an acceptable manner.

Every cultivator of the soil should have for his chief aim its permanent improvement. It costs no more to grow a crop of wheat, corn or cotton on rich soil than on poor. The increased yield above the cost of production is profit. If one acre will produce twelve bushels of wheat at a cost of six bushels, there remains a profit of six bushels per acre. If another acre produces twenty-four bushels at the same cost there is a profit of eighteen bushels, an increased profit of 300 per cent from doubling the yield. There is no one thing that the farmer should keep more constantly in mind than the necessity of increasing the fertility, or producing capacity of his land. For the past four or five years the Experimental Station has carried on a number of experiments for the purpose of determining the fertilizing effects of cowpeas grown between successive crops of oats, wheat and other crops. In every instance when these tests have been conducted on soil of moderate fertility for the benefit of either oats or wheat, the profit derived from the crop of cowpeas has been greater than the profit from the above-mentioned grains, notwithstanding that the oats and wheat have

yielded an average increase of a little more than 40 per cent induced by the cowpea. In one case a plot sown to cowpeas in the spring produced $18 worth of hay and was followed by a crop of oats valued at $18.50, making the returns from the acre $36.50. Another plot of oats that had not followed cowpeas yielded only $11.58 worth of oats. In the same length of time the plot planted to cowpeas and oats yielded $36.50, while the oats alone yielded only $11.58. This was an increase in value of more than 300 per cent, and the soil was more fertile at the end of the period than it was at the beginning. In another ccase cowpeas grown just before a crop of wheat and cut for hay, produced $19.33 worth of hay and the pea stubble increased the yield of the following crop of wheat 61 per cent. The wheat was valued at $13.20, making a total of $32.53 against $8.08 worth of wheat grown on an adjacent plot and not preceded by a crop of cowpeas. This represents a 400 per cent increase in the value of the products taken from the soil, due solely to the growing of one crop of cowpeas before the soil was seeded to wheat. In this case the value of the cowpea hay was $6.13 more than the value of the crop of wheat, notwithstanding an increase of 61 per cent in the yield of wheat from the fertilizing effects of the cowpea stubble. These tests were made on a light sandy soil, deficient in vegetable matter, and would ordinarily produce ten or twelve bushels of wheat. This character of soil prevails throughout the South. It responds promptly and profitably to fertilization, and particularly is the response noticeable where the fertilization is brought about by the application of bulky vegetable materials of approved composition, such as leguminous plants, stable manure and the like. Such materials not only give better returns than are secured from the use of commercial fertilizers, but the effects are more lasting. They increase the moisture-holding and moisture-retaining properties of the soil, improve its physical properties and present conditions more favorable to nitrification.

In 1889, a series of tests were inaugurated for the purpose of determining the residual effects of the manural constituents of cowpeas as compared with commercial fertilizer. These tests were made with wheat, and the phosphoric acid, potash and nitrogen of the fertilizers were combined in the proportions

demanded by wheat. The four years' results appear in the following table:

No. of Plots.	Treatment of Plots.	Years Wheat was Harvested. Bushels per acre. 1899	1900	1901	1902	Total Yield ffor Four Years.
1	Wheat following wheat five years	10.8	10.4	9.9	10.2	41.3
2	Cowpeas each year after first crop	11.1	14.3	14.8	16.9	57.1
3	Cowpeas—whole plants plowed in in 1898	15.8	14.8	11.8	11.8	54.2
4	Cowpeas—stubble plowed in in 1898.....	15.8	12.2	10.1	10.9	49.0
5	100 lbs. nitrate of soda in fall of 1898..	13.7	9.8	9.4	10.1	43.0
6	200 lbs. nitrate of soda in fall of 1898	14.0	10.2	9.5	10.3	44.0
7	400 lbs. complete fertilizer in fall of 1898	14.9	11.6	10.4	10.8	47.7
8	600 lbs. complete fertilizer in fall of 1898	15.4	12.0	10.4	10.8	48.6
9	800 lbs. complete fertilizer in fall of 1898	15.9	14.1	10.9	11.2	52.1
10	Cowpeas—while plant plowed in in fall of 1898	15.6	16.4	13.3	13.8	59.1
11	Cowpeas—stubble plowed in in fall of 1898	16.2	13.9	10.8	11.2	52.1
12	Wheat following wheat five years.....	10.4	10.8	8.1	9.8	39.1
13	Cowpeas each year after first crop....	10.6	14.9	15.3	17.6	58.4

In 1898 the whole area devoted to the above tests was in wheat and in orchard grass the previous year. After the 1898 wheat crop was harvested the land was thoroughly broken and rebroken three months later, and just before the 1899 crop was sown in October, 1898. Plots 3, 4, 10 and 11 were sown to Whippoorwill cowpeas immediately after the wheat crop of 1898 was harvested. All plots were plowed alike when prepared for the cowpeas, and again plowed and prepared when the pea plots were sown to wheat. The whole cowpea plant was plowed in on plots 3 and 10, and only the stubble on plots 4 and 11. These four plots were not again sown to cowpeas or fertilized. They were plowed twice each year between the harvest of one crop and the sowing of the next, which was true also of all of the thirteen plots. After harvesting the wheat of 1899, plots 2 and 13 were sown to cowpeas and the vines mown for hay, only the stubble being plowed in. This sowing and harvesting of cowpeas between crops of wheat was continued throughout the test on plots 2 and 13. Plots 5-9, inclusive, received applications of fertilizers designated only before the sowing of the 1899 crop. No further care was given the soil of these plots between crops

of wheat except the plowing just after the harvesting of one crop and just before the sowing of the next.

The crop of wheat harvested from plots 1, 2, 12, and 13 (which were not preceded by a crop of cowpeas) gave an average yield of 10.72 bushels of wheat per acre, while plots 2, 4, 10, and 11, that were preceded by cowpeas, produced 15.85 bushels of wheat per acre, an increase of a little more than 50 per cent induced by the cowpeas. The fertilizer applied to plot 9 (800 pounds) cost $11.20 delivered at Fayetteville, yet this heavy application caused an increased production of only .05 of a bushel more than the average increase of plots 2, 4, 10, and 11, sown to cowpeas. Plot No. 11, fertilized with only the stubble of cowpeas, produced .03 of a bushel more than plot 9, to which was added 800 pounds of commercial fertilizer valued at $11.20.

These remarks have taken into consideration only the first year's results which conform closely to those published in Bulletin No. 62 of this Station. Plot No. 1 shows a decrease each year from the first year's yields, and plot No. 12 each year after the second . These two plots must be used as standards for comparison, by which the measure of the good effects of the commercial fertilizers and of the cowpeas may be determined. The slight falling off in yield in 1901 is attributed to the decided deficiency in precipitation for that year, and has no bearing upon the fairness of the conclusions.

The average yield for the four years of plots (1 and 12) upon which no fertilizers were used or cowpeas grown, was 10.05 bushels per acre. The whole cowpea plant plowed in (plots 3 and 10) gave an average increased yield of 16.55 bushels per acre, and the stubble (plots 4 and 11) an increase of 10.45 bushels per acre for the four years. These increases resulted from growing cowpeas but once, and before the first crop of wheat was sown. Cowpeas planted between each crop of wheat (but not before the first) gave an increase of 17.65 bushels per acre for the four years against an increase of only 12 bushels from 800 pounds of fertilizer applied to the first crop of wheat. Two hundred pounds of nitrate of soda applied to the first of four successive crops gave a gross yield of only one bushel more than 100 pounds. The average yield of the two nitrate of soda plots gave only 3.4 bushels more in four years

than the yield of plots 1 and 12, receiving no manures, while the first year's yields shows an increase of 6.5 bushels from the nitrate of soda plots over plots 1 and 12. Comparing the plots fertilized with nitrate of soda with plots 4 and 11, we have an average yield of 2.15 bushels more from the stubble plots than from the nitrate of soda plots for the first year, while the value of the cowpea hay removed from the stubble plots was worth approximately three times as much as the nitrate of soda cost. The gross average yield of the stubble plot produced in the four years 7 bushels of wheat more than the nitrate of soda plots. This shows four items of profit derived from the stubble plots as compared with the nitrate of soda plots:

First, the saving of the cost of nitrate; second, an increased yield of 7 bushels of wheat; third, the value of hay cut from the stubble, and fourth, the 16 per cent increase in fertility of the land. After cutting the cowpea hay between the crops of wheat (plots 2 and 13) there remained in the soil an increase in fertility sufficient to produce in four years 17.55 bushels more wheat than was grown on plots 1 and 12, where wheat followed wheat for four years without cowpeas between, thus giving an increase of 40.8 per cent in the yield of wheat and in addition cowpea hay equal in value to the wheat grown on the same plots.

When the character of the soil upon which these experiments were conducted is taken into consideration, it is more than probable that the residual effect of whatever manural substances applied would be more lasting in soils less open and more retentive. This soil is a deep, gravelly, sandy loam, rolling, and has a somewhat porous subsoil. On the other hand it is just such soils that are more permanently benefited by the applications of slowly decomposing organic matter than by less lasting fertilizing materials. The 800 pounds of fertilizer on plot 9 plowed in at the same time as the cowpea vines of plot 10 gave .3 of a bushel more wheat in 1899, but 2.6 bushels less in 1902, under identical treatment from October, 1898, to June, 1902, while the fertilizing effects of the one crop of cowpeas plowed in in the fall was greater than the fertilizing effects of 800 pounds of complete fertilizer applied at the same time, adding 7 bushels of wheat to the yield in four years and leaving the soil more fertile at the end of four years than the 800 pounds of fertilizer left it.

Just how long the continuous growing of wheat (or other

grain) with cowpeas between each crop would give increased yields of wheat would depend upon the quantities of phosphoric acid and potash in the soil and becoming available for each crop. That the cowpea stubble will supply a sufficient amount of nitrogen is evident by half a hundred experiments conducted by the Station within the past six years. This nitrogen, or at least the greater portion of it, is taken from the air while the phosphoric acid and potash must necessarily come from the soil, and the quantities of these two fertilizing ingredients removed by the cowpea hay and the crops of wheat represent the quantities removed from the soil. If deep plowing, the subsoiling effects of cowpea roots, weathering and other operating agencies do not render available quantities of phosphoric acid and potash proportionate to the quantity removed by the harvested crops, the soil will become gradually exhausted, notwithstanding the cowpeas, and it will become necessary to resort to direct applications of phosphoric acid or potash or both. Just how many years would elapse before this would become necessary will of course depend upon the composition of the soil and its past and present treatment, and can be determined only upon the merit or demerit of each case.

The Time to Plow Under Cowpea Vines and Stubble.

The plowing under cowpea vines or cowpea stubble, like any other farm operation or practice, may be rightly or wrongly done. In utilizing a crop of cowpeas for their fertilizing effects, there are so many things that should be taken into careful consideration that each case must be adjudged by itself. In beginning the discussion of this subject the writer wishes it to be understood that he does not advocate plowing under cowpea vines except in special cases and in following thoroughly considered and well-matured plans. On a well-regulated farm and under ordinary circumstances there is about as much common sense in plowing under cowpeas ready for the mower as there is in plowing in timothy, corn, wheat or cotton, instead of harvesting them for market or for feed, as the case may be. The greatest error in Southern farming is to be found in the small number and inferior quality of the animals kept. There is not one in fifty cotton belt farms that has its complement of live stock. On the other hand, under the existing and peculiar conditions of many farms it is more expedient to use a crop of cow-

pea hay for fertilizer than for other purposes. A majority of the cotton states do not produce as much hay as they consume.

A ton of cowpea hay is worth as much as a stock food as a ton of wheat bran, and worth more, if a fair quantity of ripe peas are saved with the hay.

The most profitable use to be made of the cowpea plant is to feed it to live stock. Cowpeas are grown, however, quite extensively for plowing in, and the time of plowing them in is more frequently controlled by the convenience of the operator than by appropriateness of time, condition of the cowpeas, character of soil or nature of the crop that is to follow. Having grown a crop of cowpeas for its fertilizing effects upon the soil the treatment should be such as to secure the best results with the least harm to the crop that is to follow, and with the least loss of the fertilizing ingredients of the cowpea plant. If the soil is of a light sandy nature, and subject to washing by winter rains, fall plowing should be avoided unless there is an excessively large quantity of pea vines to be plowed in. In the South the soil is not frozen enough to prevent the decomposition of the vines in the winter, and there may be a decided loss of the fertilizing ingredients, and the heavy winter rains will do more damage to freshly plowed areas on rolling ground than the fall plowing will do good. A decided majority of southern soils are very subject to washing, and usually suffer greater loss of plant food by their not being protected from washing than by the removal of plant food in the crops taken from the soil. Such soils are not benefited by fall plowing so much as they are harmed, and need the protection of terraces and whatever vegetation it is possible to have upon them through the winter. Soils that are of a compact nature and not subject to washing are benefited by fall plowing, and on such soils the cowpeas may be plowed under in the fall. In either case, however, a winter cover crop will aid in binding the soil against washing and take up valuable plant food that otherwise would be lost. Upon light soils it is often a serious error not to follow fall plowing with rye, wheat, oats, or some other winter crop. These catch crops far more than pay their cost in improvement and protection to the soil, and may be harvested or plowed under in the spring to be followed by whatever crop it is the intention of the farmer to grow.

The quantity of vines that may have been produced has a direct bearing upon the time they should be plowed in. In 1902, one plot each of New Era and Extra Early Black Eye produced less than 800 pounds of hay per acre, and one plot each of Clay, Iron and Wonderful with identical treatment and on like soil, produced more than 8000 pounds of hay per acre. While such extremes in yields of hay is due entirely to variety habits, they are wider than have before occurred in the experience of the writer. Nevertheless, they serve to illustrate the necessity for different treatment when heavy or light yields of pea vines are to be utilized directly for fertilizing purposes. Should so light a growth as 800 pounds, or even twice this quantity of vines be plowed under in the fall a very large proportion of the most valuable fertilizing ingredients would disappear, in our mild climate before planting time the following spring. The loss could, however, to a great extent be prevented by having the soil seeded to some winter growing crop, such as rye, vetch, wheat, etc., and so small a quantity of green vegetable matter plowed in would not perceptibly injure these winter crops. Should 8000 pounds of cowpea vines, or even half so much, be plowed under in the fall and followed by a winter crop, the damage of this large amount of fermenting and decomposing vegetation would seriously damage, if not destroy, the winter crop, if a liberal application of lime was not made (see Arkansas Experiment Station Bulletin No. 62). Furthermore, the varieties of cowpeas that produce the heaviest yield of vines usually continue green and growing until frost, if not harvested before frost occurs, and in this succulent condition are more calculated to do harm than more mature vines. Should soil occupied by a heavy growth of cowpeas in the fall be intended for some spring sown crop, it may or may not be advantageous that the vines be plowed under in the fall. In such a case the susceptibility of the soil to washing, its physical properties and local conditions and surroundings should be considered, and without losing sight of the advantages of grazing the pea vines. When the time approaches for plowing under cowpea vines in the fall, the degree of maturity of the crop has an important bearing upon determining whether they should then be plowed or left over until the early spring. If the cowpea vines are mature, best results will usually come from fall plowing, particularly if the land is com-

paratively level, and mature vines plowed under may safely be followed by fall crops of grain, grasses or legumes. If green, they cannot safely be followed by such crops and best results will usually follow when they be permitted to remain until early spring, if not to be grazed. When cowpeas are plowed in and to be followed by another crop, the length of time that should elapse before the sowing of the next crop should be determined by the quantity and maturity of the vines when plowed in, and the weather conditions prevailing between the plowing in of the cowpea vines and the planting of the crop that is to follow. If plowed under in the fall it is not infrequently the case that dry weather follows the operation and the vines remain for some weeks in an undecomposed condition, or only partly decomposed. When rain does fall the vines are in much the same condition as when plowed under green with the soil in good condition as regards moisture.

It is often a difficult task to plow under a heavy crop of cowpeas and have the soil in good condition and the vines well covered. This difficulty is particularly noticeable when Iron, Clay, Red Ripper and such vining varieties are to be plowed under, the tangled mass of vines making it in many cases impossible to do a good job with the tools ordinarily found upon the farm. In plowing under such heavy crops the work may be done quite satisfactory if the field is first gone over with an ordinary stalkcutter, and in such manner that the furrows of the turning plow will be parallel with the direction of the stalk cutter. The blades of the stalk cutter cut the pea vines into strips at right angles to the furrow and a rolling coulter attached to the beam of the turning plow cuts the vines again, but at right angles to the stalk cutter. The stalk cutter presses the vines near the ground, cutting them one way while the coulter cuts them again, enabling the plow not only to run more steadily, but to completely cover the pea vines, insuring their more rapid and uniform decomposition.

Cowpeas Planted in Corn at Last Plowing.

The very common practice of sowing cowpeas in corn when the latter is given its last cultivation suggested the experiment reported in Bulletin No. 70, page 104. This test shows that "the value of two successive crops of corn without cowpeas sown in

them was $21 (per acre), while the value of two successive crops of corn plus the value of a crop of cowpeas sown in the first crop was $33.54 (per acre)." In the above test corn and peas were valued at 50 cents per bushel and cowpea hay at $10 per ton, which was the approximate local market value of these products in 1899 and 1900. In 1901 and 1902, these tests were repeated with additional plots from which the peas were gathered, but the vines allowed to remain in the field and grazed by cattle when the corn had been gathered. The local market value of cowpeas and corn in 1901 and 1902 was $1 and 70 cents per bushel, and cowpea hay $10 per ton. The severe drouth of 1901 lowered the average yield of corn to about one-third of a full crop. The yield of cowpeas, however, was the highest recorded at Fayetteville, and the cowpea hay yield was above the average for the past five years. Notwithstanding the unusual deficiency of moisture the presence of the growing cowpeas had no appreciable effect to lower the yield of corn. The following table gives the corn and pea yields and the value of the crops produced in two years:

		Yield Per Acre.				
		1901			1902	
No. plot.	Description of Plot.	Corn Bushels	Peas Bushels	Cowpea Hay, Pounds	Corn Bushels	Value of the two years Crops.
1	No peas	8.4	....	......	24.4	$22.96
2	Peas in drills	8.8	18.5	1889	31.9	55.83
3	Peas broadcast	8.0	9.9	1546	33.6	46.15
4	Peas in drills	8.4	19.3	Grazed	37.4	50.76
5	Peas broadcast	7.8	8.4	Grazed	39.2	40.70
6	No peas	9.1	....	......	26.1	24.64

Value of cowpeas, $1 per bushel.

Value of cowpea hay, $10 per ton.

Value of corn, 70 cents per bushel.

Average value of product from plots without cowpeas, $23.80.

Average value of product from plots with cowpeas, both peas and hay harvested, $50.99.

Average value of yields from plots with cowpeas, peas gathered and hay grazed, $45.73 plus $8.58.

It must be remembered that no account is taken of the value of the vines on the plots grazed. The yield of cowpea vines was apparently as heavy on plots 4 and 5 as on plots 2 and 3, and it is fair to assume that the hay of plots 2 and 4 and 3 and 5 possessed equal value. In one case, however, the cost of cutting and housing was saved by having the vines gathered by the cattle, and it is fair to estimate the total value of the crops grown on plots 4 and 5 at from 10 to 20 per cent more than appears in the table. The plots sown to cowpeas in 1901 and grazed produced in 1902, 5.45 more bushels of corn than the plots from which hay was harvested. Since the cattle were excluded from the field in wet weather (thus reducing the injury from trampling to a minimum), it is probable that the 5.45 bushels of increased yield from the grazed plots resulted from the droppings of the cattle, since they spent the greater part of their time on the plots from which the pea vines were not harvested. When records have been made of the yields of shelled peas planted in corn there has been from 50 per cent to 200 per cent increase in favor of planting in drills as compared with sowing broadcast, with comparisons of the same varieties of cowpeas. Some varieties sown broadcast in corn have yielded no peas. The yield of hay has rarely been as great from broadcast sowings as from drill culture, notwithstanding the deduction of the weight of peas and hulls from the drilled plots.

Referring to the results tabulated above, it will be seen that the total value of the two years' crops on plots 2 and 4 with drilled cowpeas is $50.99 per acre, and of plots 1 and 6, upon which no cowpeas were sown is $23.80 per acre. This is an increase of 113.8 per cent in value of crops grown the two years. The plots upon which the cowpeas were broadcasted gave an increase in value of 92.1 per cent per acre. These two estimates do not take into consideration the value of the vines grazed by the stock A comparison of the value of the two years' crops produced on plots 1 and 2 shows an increase in value of 143.2 per cent per acre from drilling cowpeas over corn with no cowpeas. The corn used in these tests was the ordinary white dent usually grown in this locality. The variety of cowpeas sown was Warren's Extra Early, a variety particularly suited to late planting. This variety is the best general purpose pea tested by the Station for a period of years. The New Era planted in corn at

its last cultivation has uniformly given slightly better yields of peas, but less hay than the Warren's Extra Early.

The practice of growing cowpeas with corn is deserving of high commendation. The peas curtail the yield of corn to a very slight extent or not at all. The value of the shelled pea is not infrequently equal to the value of the corn gathered from the same area, and added to this is the value of the pea vines for cattle feed and the fertilizing value of the cowpea roots and stubble, shading and protecting from washing. In 1901, two plots of corn averaged but 8.6 bushels per acre, while cowpeas drilled between the corn rows yielded 18.9 bushels of shelled peas per acre, the drouth severely cutting off the yield of corn and apparently inducing greater fruitfulness of the peas.

It has been stated that no account was taken of the value of the pea vines grazed from plots 4 and 5. This was not done because no determination was made of the effects upon the animals that were employed in grazing the plots. The object of the test being to compare the effects upon the next crop of corn, of the grazed pea stubble with the mown pea stubble. This makes the total value of the crops grown upon plots 4 and 5 appear less than it really was, and it is perfectly fair to add to these figures the value of the hay gathered from plots 2 and 3, and to assume that the yields of hay on plots 2 and 3 were the same as on plots 4 and 5. This raises the total value of plots 4 and 5 to $60.20 per acre, $48.43 per acre, respectively, the drilled peas giving a value of $11.77 per acre more than the broadcast peas. Plot 1 without cowpeas yielded $22.96 worth of corn in two years, and plot 4 with drilled cowpeas (the peas gathered and the vines grazed), yielded with the corn $60.20 in value, an increased value of 162.1 per cent. Compared with plot 1 the broadcast peas of plot 5 gave an increased value of 110.9 per cent per acre of corn, peas and hay, by comparison with plot 1 planted to corn with no cowpeas.

Since the plots upon which cowpeas were grown in 1901 produced from 3.19 to 39.2 bushels of corn, and with no cowpeas produced only 24.4 and 26.1 bushels per acre in 1902, it is reasonable to suppose that the former plots are in condition for better crop production in 1903 than the latter. Thus the planting of cowpeas may be credited with four items of profit: (1) With an increase of 22.8 per cent in the yield of corn; (2) the value of

the shelled peas; (3) the value of the pea vines; (4) the increased capacity of the soil for future crop production, any one of which exceeds the gross cost of planting, growing and harvesting the cowpeas.

Cowpeas as a Catch Crop After Wheat.

Experiments reported in Arkansas Experiment Station Bulletin No. 62, pp. 25 and 27, illustrate the beneficial effects upon wheat, but do not take into consideration the value of the cowpeas or cowpea hay. These omissions from the plan of the work leading to the results published in Bulletin No. 62, suggested the carrying out of similar tests in which the value of the cowpeas and the cowpea hay should be taken into account, as well as the increase in the yield of wheat.

The soil upon which this test was conducted produced a crop of rye and vetch in 1900. The rye and vetch were mown for hay and cowpeas sown broadcast. The cowpeas were cut for hay one week before the wheat was sown. As soon as the wheat was harvested the following June (1901) four varieties of cowpeas were drilled upon seven plots. One plot was left bare, but cultivated three times in July and August when the cowpeas were cultivated. When the crop of peas was harvested the eight plots were again sown to wheat. The yields and value of the two crops of wheat (1901 and 1902), the yields and value of the intervening crop of cowpeas and the total value of the crops occupying the soil from October, 1900 (when the first crop of wheat was sown), to June, 1902, when the second crop of wheat was harvested, are recorded as follows:

	1901								1902		
No. of Plot	Yield Wheat per acre.	Value Wheat per acre.	Yield Shelled Peas per acre	Yield Cowpea Hay per acre.	Value Shelled Cowpeas per acre	Value Cow Pea Hay per acre.	Total Value Crops in 1901.	Yield Wheat per acre.	Value Wheat per acre	Total Value Crops of both 1901-1902.
1	14.7	$11.76	....	1,764	.....	$ 8.82	$20.58	15.8	$12.64	$32.22
2	13.4	10.72	6.5	1,341	6.50	6.70	23.92	14.1	11.28	35.20
3	13.7	12.08	10.1	1,630	10.10	8.15	31.05	16.2	12.96	44.01
4	14.4	11.51	8.6	1,904	8.60	9.52	29.64	15.9	12.72	39.26
5	16.3	13.04	.....	2,324	....	11.62	24.66	16.3	13.04	37.70
6	14.4	11.52	11.2	2,004	11.20	10.02	32.74	16.5	13.20	45.94
7	15.2	12.16	.....	2,640	.....	13.20	25.36	17.4	13.92	39.28
8	14.8	11.84	No Cowpeas			.....	11.84	13.6	10.88	22.72

In the above test cowpeas were drilled at the rate of 15 pounds to the acre. Plots 1 and 2 were seeded to Whippoorwill, plot 3 to New Era, and plots 4 and 5 to Extra Early Black Eye, plots 6 and 7 to Warren's Extra Early. Plot 8 was plowed with the others when they were being prepared for the cowpeas, and cultivated at the same time and in the same manner as plots 1-7, inclusive. The value of the cowpeas and cowpea hay grown after the wheat crop of 1901 was harvested was greater in some cases than the value of the wheat crop that preceded the cowpeas.

The average value of the crops of wheat and cowpeas grown on plots 1-7, inclusive, in 1901 was $26.85 per acre. These plots produced a crop of both wheat and cowpeas. The value of the crop of wheat gathered from plot 8, which was not seeded to cowpeas, was only $11.84. Thus the increased value of crops for the one year was 126 per cent on plots with cowpeas following wheat as compared with following the wheat with no summer crop. The cowpeas grown after wheat in 1901 added 1¼ bushels of wheat to the 1902 crop of wheat. The plots seeded to cowpeas after the wheat was harvested in 1901 produced in 1902 an average of 2.43 bushels more of wheat than the plot not seeded to cowpeas, an increase of 17.8 per cent.

Cowpeas Facilitate Preparation of Seed Beds.

Aside from the manural effects of cowpeas upon crops that follow them, they afford conditions peculiarly favorable to the proper preparation of the soil for the reception of fall sown seed of whatever description or class. It is too frequently the case that grasses, clover, alfalfa, and the like fail to succeed for no other reason than that the soil was not properly prepared for the seed, and that a promising growth of these hay and pasture crops come to naught on account of the survival of the more fit weeds. In preparing soil for hay or pasture plants one of the first essentials to success in the suppression of all weeds, and another is the thorough preparation of the soil for the reception of the seeds of these crops. Cowpeas have no superior in the suppression of weeds and greatly facilitate and cheapen the preparation of the soil immediately preceding the sowing of pasture and hay crops. The soil intended for such crops should be selected the fall before the seed are sown and then seeded to some grain. The grain will be ready for harvest in June, and up to this time will have prevented the ripening of practically all weed seed that will interfere

with the future hay or pasture crops. Immediately after the grain is harvested cowpeas should be sown thick enough to quickly cover the soil and further prevent weed growth. The cowpeas may be sown broadcast or in drills—if in drills cultivation should be of such thoroughness and frequency as to prevent the growth of the weeds until the cowpeas have complete possession of the soil. The cowpeas must be cut and removed in sufficient time for thorough preparation before the seed of the next crop are to be sown. The deeply penetrating roots of the cowpea have a subsoiling effect upon the land, and the dense shade promotes intrification and improves to a marked degree the texture of the soil. Immediately after the removal of the cowpeas the soil should be prepared by frequent manipulations with such tools as discs, harrow, etc. If the treating and preparation for the preceding grain crop and for the cowpeas have been well done, going over the field three or four times with a good disc harrow will give an ideal preparation for grasses and clover. Such treatment on well-tilled soil has given better results with winter wheat than were secured from deep breaking, with a turning plow when no rain had fallen between the breaking of the land and the sowing of the wheat. Experience in a number of instances has proven the value of cowpeas for furnishing good conditions for fall sown crops and particularly for grasses and clover, both alone and in mixtures.

Varieties of Cowpeas.

In the early spring of 1902 the Station collected from various sources 123 samples of cowpeas, embracing about thirty varieties under about forty-five names. These were planted on 123 plots of equal size, each plot receiving the same number of seed and the stand finally reduced to the same number of plants for each plot. The seed were planted in drills 3½ feet apart, with a space of 7 feet between each plot. All plots were cultivated until the vines covered the ground. It was necessary that the field be gone over twice to turn back the vines of many plots to prevent their encroachment upon the territory of their neighbors seven feet away, while others barely met across the 3½-foot rows. The extremes in production of both hay and shelled peas is remarkable, varying from 8700 pounds of hay per acre to 700 pounds, and from 40 bushels of shelled peas to no peas at all.

The following table gives the names of varieties, sources of seed, number of peas required to weigh one ounce of both the seed planted and the seed gathered, weight of hay per acre, bushels of shelled peas per acre and per cent of peas in hulls:

				No. of Peas in one ounce				
No. Plot	Variety	Weight per bushel.	Source of Seed.	Planting	Gathered	Yield hay in lbs. per bu.	Yield Peas in bu. per acre.	Per cent Peas in hulls.
1	Whippoorwill ..	54	Arkansas	140	136	1300	13.3	67.3
2	Whippoorwill ..	55	Georgia	168	132	2500	8.5	66.1
3	Whippoorwill ..	55	Virginia	168	132	1700	14.1	65.4
4	Whippoorwill ..	54	Tennessee	156	124	2100	13.1	66.3
5	Whippoorwill ..	54	Louisiana	146	128	2200	13.3	68.0
6	Whippoorwill ..	54	... .	160	128	1800	15.4	70.4
7	Whippoorwill ..	56	Florida	156	132	1900	17.7	65.8
8	Whippoorwill ..	55	Kentucky	164	132	1900	19.8	76.0
9	Whippoorwill ..	60	Tennessee	216	160	2100	20.8	68.0
10	Whippoorwill ..	56	Tennessee	140	128	1700	15.4	58.7
11	Whippoorwill ..	55	Georgia	152	132	1700	17.3	66.8
12	Whippoorwill ..	57	South Carolina ..	164	124	2300	11.6	52.3
13	Red Whipp'rwill.	62	Georgia	184	156	5500	1.2	60.0
14	Whippoorwill ..	58	Georgia	148	132	1900	21.6	64.1
15	Whippoorwill ..	56	Georgia	164	132	1700	22.2	62.2
16	Clay	54	Arkansas	140	120	8700	2.1	58.3
17	Clay	55	Virginia	200	148	3800	3.7	60.0
18	Clay	56	Georgia	168	116	4200	5.4	65.7
19	Clay	..	Tennessee	160	...	8200	....	....
20	Clay	54	Louisiana	196	128	4800	2.7	53.5
21	Clay	54	Alabama	148	144	7300	2.8	61.1
22	Clay	..	Louisiana	192	140	8300	2.1	66.6
23	Clay .....' ..'.	..	... .	160	...	5900	....	....
24	Clay	56	Florida	144	120	4600	5.2	67.1
25	Clay	55	South Carolina	144	144	5000	6.7	61.4
26	Clay	..	Georgia	168	...	7400	....	....
27	Taylor	57	Arkansas	96	88	2800	8.9	64.7
28	Taylor	60	Virginia	100	96	2300	10.6	68.3
29	Taylor	60	Tennessee	112	92	Lost	8.1	66.0
30	Taylor	60	Tennessee	136	96	1700	8.1	64.2
31	Taylor	58	Maryland	132	88	2900	7.0	66.3
32	Taylor	59	Louisiana	112	82	2400	6.9	65.2
33	Taylor	60	Kentucky	88	86	1800	6.0	65.8
34	Taylor	60	Alabama	100	88	1700	3.7	66.6
35	Taylor	59	Tennessee	104	90	1700	6.9	64.8
36	Taylor	59	South Carolina ..	96	88	1900	6.0	60.2
37	Wonderful	..	Virginia	180	...	7000	....	....
38	Wonderful	..	Georgia	188	...	4600	....	....

No. Plot	Variety.	Weight per bu.	Source of Seed	No. of Peas in one ounce. Planted.	Gathered.	Yield hay in lbs. per ton.	Yield Peas in bu. per acre.	Per cent Peas in hulls.
39	Wonderful	..	Louisiana	136	...	4700	....	....
40	Wonderful	..	North Carolina..	204	.....	3300	...	...
41	Wonderful	..	Tennessee	168	...	4000	....	....
42	Wonderful	..	Louisiana	164	...	3000	....	....
43	Wonderful	..	Florida	146	...	7000	....	....
44	Wonderful	..	Kentucky	176	...	5700	....	....
45	Wonderful	..	Georgia	168	...	4400	...	...
46	Wonderful	..	South Carolina ..	180	...	5400	....	....
47	Wonderful	..	Georgia	176	...	5700	....	....
48	Wonderful	..	Georgia	153	...	4000	....	....
49	Wonderful	..	Georgia	168	...	8300	....	....
50	Red Ripper	57	Arkansas...	144	124	4300	3.5	66.0
51	Red Ripper	..	Virginia	164	128	4500	1.7	60.0
52	Red Ripper	..	Georgia	184	...	3300	....	....
53	Red Ripper	..	North Carolina ..	184	...	3500	....	....
54	Red Ripper	..	Tennessee	146	...	4600	....	....
55	Red Ripper	55	Louisiana	186	124	3500	5.0	70.7
56	Red Ripper	56	Alabama	128	124	2300	7.1	63.8
57	Red Dipper	..	Louisiana	156	...	3800	....	....
58	Red Ripper	..	Florida	192	...	2600	....	....
59	Red Ripper	..	Georgia	150	...	4900	....	....
60	Red Ripper	..	Georgia	188	...	3200	....	....
61	Black	60	Louisiana	148	112	2700	19.6	65.2
62	Black	61	Arkansas	100	96	2400	13.0	63.2
63	Black	61	Virginia	144	136	2800	10.4	62.5
64	Black	..	Georgia	168	...	3900	....	....
65	Black Bunch ...	60	Louisiana	124	88	2300	15.0	66.0
66	Black	58	Tennessee	160	136	3900	6.0	65.1
67	Black	58	Louisiana	140	96	5100	3.3	61.5
68	Black	56	South Carolina ...	96	92	5100	9.1	66.6
69	Black	..	Georgia	136	...	5700	....	....
70	Crowder	55	Georgia	136	104	4900	5.0	68.5
71	Crowder	55	Arkansas	104	88	3900	4.1	68.9
72	Clay Crowder ..	53	Louisiana	112	80	5700	7.3	70.0
73	Br'n Eye Crow'r	..	Alabama	108	92	2700	2.9	70.0
74	Sugar Crowder.	..	Alabama	120	...	7300	....	....
75	Speckle Crow'r.	58	Georgia	124	84	5700	12.5	75.0
76	Brown Crowder.	54	Georgia	124	96	6800	5.6	67.5
77	Clay Crowder ..	51	Arkansas	108	88	3700	5.6	67.5
78	Lge White Crow	..	Georgia	108	84	6200	2.5	75.0
79	Lady	54	Arkansas	236	176	4700	5.2	63.2
80	Lady	60	North Carolina ..	264	184	4800	6.2	65.2
81	Lady	..	Louisiana	280	...	3200	....	....

No. Plot	Variety..	Weight per bu.	Source of Seed.	No. of Peas in one ounce. Planted	Gathered	Yield hay in lbs.. per bu.	Yield Peas in bu. per acre.	Per cent Peas in hulls.
82	Jones' Prolific..	52	Alabama	196	148	2100	8.3	65.5
83	Conch	..	Louisiana	230	236	7600	11.2	55.4
84	Lady	59	Georgia	284	188	1700	10.8	65.0
85	Lady	59	Georgia	256	208	3600	5.2	69.4
86	New Era	60	Arkansas	208	176	1900	19.6	61.8
87	New Era	59	Virginia	220	180	1200	21.0	[illegible]
88	New Era	58	Maryland	248	196	700	22.3	68.3
89	New Era	60	Georgia	228	188	1300	19.6	67.1
90	Ex. E. Blk. Eye.	54	Arkansas	92	84	1200	15.8	70.3
91	Ex. E. Blk. Eye.	57	Virginia	124	100	1400	16.7	75.0
92	White Giana ...	58	Alabama	112	100	1100	16.1	64.4
93	Ex. E. Blk. Eye.	54	Kentucky	92	100	1800	20.0	75.0
94	Cal. Black Eye..	60	Arkansas	108	104	1500	12.5	65.2
95	Black Eye	62	North Carolina ..	200	160	4000	11.2	71.0
96	Black Eye	59	Indiana	124	136	800	18.2	70.7
97	Black Eye	59	South Carolina ..	120	96	1600	15.2	67.5
98	Black Eye ...	59	Oklahoma	136	136	700	17.1	74.5
99	Black Eye	53	Georgia	112	104	1700	16.6	65.5
100	Large Black Eye	61	Arkansas	128	108	1000	16.4	69.9
101	Large Black Eye	59	Virginia	132	88	1200	11.6	71.2
102	Large Black Eye	59	Louisiana	204	104	3500	17.9	66.1
103	White Blk Eye..	62	Georgia	107	156	2900	21.0	64.3
104	Warren's Ex. E.	55	Arkansas	120	108	1700	23.5	64.2
105	Mt. Olive	57	Maryland	168	132	1100	22.9	56.9
106	Warren's Ex. E.	58	Pennsylvania	192	140	1600	26.2	67.7
107	Southdown	61	Virginia	224	160	4800	10.2	67.1
108	Calico	60	Louisiana	212	148	3100	6.2	68.7
109	Calico	60	Kentucky	136	148	3700	20.8	69.4
110	Coffee	57	Louisiana	132	134	Lost	20.4	69.0
111.	Wild Goose	56	Arkansas	104	92	3100	16.6	68.9
112	Indian	59	Louisiana..... ..	128	84	7800	10.6	64.5
113	White Br'n Eye.	60	Louisiana	140	110	2100	20.8	71.0
114	Brown Eye	60	Arkansas	136	136	2200	18.3	70.9
115	Md Wht Bn Eye	61	Georgia	196	142	4300	5.0	72.7
116	Old Mans	54	Arkansas	180	160	1700	14.8	63.3
117	Warren's N Hyb	55	Arkansas	200	158	1200	18.5	67.4
118	Red Yellow Hull	56	Louisiana	152	112	8000	29.1	77.5
119	Iron	59	Louisiana	188	176	6200	21.2	65.3
120	Iron	59	South Carolina ..	200	180	8300	23.1	55.2
121	Watson's Hyb'd.	60	Louisiana	200	146	5800	40.4	71.3
122	E. E. Brown Eye	58	Louisiana	140	112	3700	26.8	69.3
123	Speckled Java..	59	Georgia	112	82	6900	22.7	68.5

The weights of ha ygiven above do not include the peas.

An examination of the above table will show several results worthy of note. The heaviest yield of hay, 8700 pounds, was secured from Clay peas (plot 16), and the lightest, 700 pounds, from New Era and Black Eye (plots 88 and 98). No peas ripened on plot 16, while plots 88 and 98 produced 1330 and 1026 pounds of shelled peas, the peas weighing considerably more than the vines that produced them. Plots 37-49, inclusive, produced no peas at all and very few blossoms appeared on these plots, which were of the variety of Wonderful or Unknown. Red Ripper and Clay gave very few peas and on some plots none at all. The peas grown in 1902 were larger and heavier than the seed planted by an average of 20.24 per cent. Only six plots gave more peas to the ounce in 1902 than the seed planted. The seed grown north of the latitude of Fayetteville gave an average of 3388.1 pounds of hay per acre, and those south 3420.7 pounds per acre. The seed grown north of Fayetteville produced 1.3 bushels of shelled peas per acre more than seed grown south of Fayetteville. The following varieties gave the highest yields of shelled peas: Calico, Coffee, Extra Early Black Eye, Iron, New Era, Red Yellow Hull, Speckled Java, Warren's Extra Early, Warren's New Hybrid, Watson's Hybrid, Whippoorwill, and White Brown Eye.

New Era, Old Man's, Warren's Extra Early, Extra Early Black Eye, and Warren's New Hybrid yield a greater proportion of peas to vines than other varieties tested and are more productive of peas than other varieties when planted in corn or after grain, and are recommended for their early maturity.

WASHING OF SOILS AND METHODS OF PREVENTION.

By J. G. Mosier, Assistant Chief Soil Physics, University of Illinois.

Illinois is the "Prairie State," but in addition to the almost boundless prairies there is an immense area of timber land, much of which is broken or hilly. The total area of the state is 56,650

square miles, or more than 36 million acres. Of this large area about eight million acres are rolling or hilly and subject to serious erosion. Most of this can be cultivated and cropped, but it is so rolling or steeply sloping that every practical means should be taken to prevent the rapid ruin of the land by surface washing. Some Illinois land has already been completely ruined, and even abandoned fields, impoverished by sheet washing or gashed by gullies beyond all chance of reclamation, are now to be found, especially in the southern counties. In some cases this land should never have been robbed of its protecting forest, the only thing that made it valuable in the first place.

There is a large area of undulating to rolling land, both timber and prairie, not included in the above estimate, that has not been badly damaged as yet, but with continued cropping and loss of organic matter from the soil these lands are becoming more subject to surface erosion, and reports of such injury are now frequently made to the Experiment Station.

The table below gives areas of some of the counties of which a detail soil survey has been made, also the area of rolling and hilly land in square miles and the percentage of this in the county.

Table 1.—Broken and Hilly Land.

County.	Area. sq. mi.	Broken and hilly land, sq. mi.	Broken and hilly land, percent.
Alexander	207	83.3	40.2
Bond	372	62.1	16.6
Clay	468	23.0	4.9
Clinton	498	13.3	2.6
Cumberland	347	36.2	10.4
Edgar	648	113.0	17.4
Hancock	765	165.5	21.6
Hardin	168	132.9	79.1
Jackson	558	264.8	47.4
Jo Daviess	656	432.3	65.9
Johnson	340	282.5	83.0
Kankakee	692	9.1	1.3
Knox	720	103.0	14.3
Lake	463	185.0	40.0
LaSalle	1156	143.2	12.4

Lawrence	362	90.5	25.0
McDonough	574	143.1	24.9
McLean	1166	78.3	6.7
Marion	570	85.3	14.9
Montgomery	702	84.2	12.0
Moultrie	354	47.2	13.3
Pike	815	508.3	62.4
Richland	360	72.0	20.0
St. Clair	680	204.0	30.0
Sangamon	860	51.6	6.0
Tazewell	650	117.0	18.0
Whiteside	700	140.0	20.0
Winnebago	540	43.0	8.0

In twenty-eight Illinois counties in which the detail soil survey has been made 22.6 per cent of the land, as an average, is of such a character that it is subject to serious damage from surface washing.

Rainfall.

Illinois lies in the belt of prevailing westerly winds, and much of our rainfall comes in moderate or gentle rains, but during the summer we occasionally have torrential rains, when a large amount of rain falls in a very short time. During the moderate showers or long gentle rains a large proportion of the water that falls soaks into the ground, but in the torrential rains, the soil is unable to absorb so much water in such a short time, and much of it runs off the sloping land. It is not an unusual thing to have two inches or more of rain fall in a few hours.

The average annual rainfall recorded for the state up to 1902 was 37.39 inches. In the northern district the average is 33.48 inches, a quarterly distribution of 5.8 inches in winter, 9.4 inches in spring, 10.7 inches in summer and 7.6 inches in autumn. The average rainfall for the central district is 38 inches, the winter rainfall being 7.1 inches, the spring 11.3, the summer 11, and the autumn 8.6 inches. The southern section has an average of 42.19 inches, of which 9.1 inches falls in winter, 12.9 in spring, 11 in summer, and 9.2 in the autumn quarter. From this we see that the greatest rainfall is in the spring and summer months, when the soil is in the best condition to absorb water, but in spite of this there is an enormous run-off from the rolling land of the state.

Run-off.

The amount of washing depends upon the amount of surface run-off. The amount of run-off and the effect it has will be modified to a large extent by the character of the soil and subsoil, by the length and steepness of the slope, by the tillage practiced, and by the vegetation produced. It is very difficult to compute the amount of run-off because of these many conditions causing variation. Considerable work has been done, however, which forms the basis for a fair estimate.

Mr. F. H. Newell, of the United States Geological Survey, has determined the amount of water running off from different catchment basins in various parts of the United States, and in this way has been able to estimate the amount of run-off as compared with the rainfall per annum. His work shows that for eight years, from 1884 to 1891, 48.9 per cent of the rain falling in the basin of the Savannah river found its way to the sea. In the Connecticut river basin an average for thirteen years gives 56.5 per cent, and in that of the Potomac for six years, from 1886 to 1891, 53 per cent ran off. In general, Mr. Newell says that where the mean annual rainfall on mountain topography is 40 inches the run-off approaches 30 inches, where the rainfall is 25 inches the run-off is about 12 inches, and where the rainfall is 15 inches the run-off is less than five inches. Where the surface is made up of broad valleys and gentle slopes in open country, a mean annual rainfall of 50 inches gives an annual run-off of about 25 inches, or 50 per cent of the rainfall; where the rainfall is 40 inches the run-off is about 15 inches, or 37½ per cent, and where the rainfall is 30 inches about 8 inches, or 27 per cent, will run off. Neither of the above represents the rolling and hilly land of this state, which is about a mean between the two forms of topography. Greenleaf estimates the average run-off for the Illinois river basin at about 24 per cent of the total rainfall of that catchment area. Leverett estimates the run-off for the entire state at about 21 per cent of the rainfall. These estimates are too low for the hilly and broken land of the state, but if we take the mean of the mountain topography and broad valleys as given by Newell we get an amount that comes near the truth. This approximate mean gives the run-off as shown in the following table:

Table 2.—Approximate Run-off for the Broken and Hilly Land of Illinois.

Districts, rainfall.	Rain fall. inches.	Run-off inches.	Run-off in percent of total rainfall.
Northern—			
Minimum	21.46	5.2	23
Average	33.48	14.5	43
Maximum	47.22	30.0	63
Central—			
Minimum	22.85	6.0	26
Average	38.01	19.0	50
Maximum	48.67	31.0	64
Southern—			
Minimum	30.05	11.0	36
Average	42.19	23.0	54
Maximum	55.68	41.0	73

These figures make the average run-off from the hilly land in the northern part of the state 43 per cent of the rainfall, for the central 47 per cent, and for the southern 55 per cent of the average annual rainfall. When we remember that these are for the hilly and broken land in these areas, the figures are probably not too high. If the Illinois river basin, with its extensive swamps and large areas of level or nearly level land, has a run-off amounting to 24 per cent of the annual rainfall, it is certainly a conservative estimate that hilly and broken land with perfect surface drainage and with slowly pervious soil should have at least twice as much.

Sheet Washing and Gullying.

The washing produced by the run-off is of two kinds, sheet-washing or general surface washing, and gullying. In the former the water is spread over a uniformly sloping surface where there is little or no tendency to collect into streams. If the soil and covering are uniform in character, the wearing of the water will be the same for all points. Ordinarily, however, it is not so simple as this. More frequently the gradient is not uniform, the general slope will contain many smaller slopes, the water will collect into streams in the draws and this accumulation water will give greater volume with less resistance, and consequently the water will attain greater velocity. The washing, or work, that the stream does varies with the velocity of the water, and this depends upon four things: The slope, the resistance to

movement, the volume of water, and the amount of sediment carried in suspension.

If a current of water with a given velocity is just able to move an object of a certain size, then a current with double the velocity will move an object of similar shape 64 times as large. Swift streams have much greater power to wash than slow ones. In general, the transporting power of running water varies as the sixth power of its velocity, or doubling the velocity increases the carrying power 64 times, and trebling the velocity increases the carrying power 729 times. Hence it is that gullies form so rapidly on steep slopes and hillsides. Hills are frequently broadly dome shaped wth a profile such that the velocity of the water increases toward the brow of the hill, due to an increase, both of slope and volume of water. This gives a skirt or zone of badly-eroded soil, while the top of the hill or ridge has suffered comparatively little from washing. The gullies thus formed work their way farther up the hill by what geologists call head erosion until a point is reached where the concentration of the run-off is not sufficient to produce a gully. In some cases the gullies are formed by the receding of small waterfalls. This is especially true where grass is growing in a draw and the gully starts in from below. The fall gradually travels up the draw, the falling water undermining the precipice and causing it to fall in. Gullies formed in this way are usually deep and wide and very difficult to fill.

On uniform slopes, gullies may be started by very simple means, such as tunnels of moles, wagon tracks and cow or sheep paths, any one of which may be the very necessary small beginning, and nature will do the rest.

Effects of Washing.

Nothing will completely ruin land more quickly than washing, especially gullying. A single season, or even a single rain, may produce gullies that cannot be crossed with ordinary farm implements. Unless these are promptly looked after, the land soon becomes practically worthless. There are already a great many fields in Illinois that have been abandoned from this cause.

Sheet washing also damages soil greatly, as may be seen in case of the "clay points," as they are commonly called. These are places where washing has occurred and the top soil has been largely removed, exposing the subsoil. They are usually unpro-

ductive, mainly because the soil is deficient in organic matter. Grains of all kinds do poorly on these "points." The supply of nitrogen in the soil is contained only in the organic matter, and the top soil contains much the larger part of this constituent. The soils of the hilly and broken lands of the state were originally somewhat deficient in organic matter, and consequently in nitrogen also; and if the scant supply is largely removed when the top soil is washed away a very bad condition results. As an average, the surface seven inches of our rolling hill lands contains only 2,000 pounds of nitrogen per acre, and the next seven inches does not contain more than one-third as much, and the next still less. If the 2,000 pounds of nitrogen per acre is not a sufficient reserve from which enough may be liberated to grow large or even fair crops, which is true, what can we expect from a soil whose nitrogen content has been reduced by loss of organic matter from surface washing to one-third of the above amount. To show the value of nitrogen to these soils, let us consider the results obtained in some pot culture experiments at the University of Illinois upon soils of this kind. The first soil was taken from washed hill land in Pulaski county and the second from broken land in Henry county. The soils were placed in pots and different elements of plant food added, except in one used as a check. Wheat was grown in the Pulaski county series, oats in the other, and when calculated to the acre basis the results were as given in Table 3.

Table 3.—Yields in Pot Cultures—Worn Hill Land.

.Treatment	Pulaski county soil, wheat, bu. per acre.	Henry county soil, oats, bu. per acre.
None	8	21
Potassium	9	23
Phosphorus	9	31
Nitrogen	69	225

It must be remembered that these yields were obtained in the greenhouse under perfect conditions. The experiment certainly tells that these soils need nitrogen, and one of the great problems of the farmers on this kind of land is not only to maintain but to increase the supply of nitrogen in the soil. The only practical way of doing this on an extensive scale is to add organic matter, by growing legumes and turning them under. (See Bulletin 115).

Prevention of Sheet Washing.

It would commonly be taken for granted that the thing of first importance in this discussion is the matter of preventing the formation of gullies in cultivated fields, but this is not the case. The beginning of the trouble is usually due to sheet washing, and as a rule gullying occurs in the latter stages of the general process of land ruin. If we can prevent sheet washing we will lessen very largely the possibilities of gullying in cultivated fields.

Four general methods are employed for the prevention of sheet washing: First, the growing of cover crops to decrease the movement of water and soil; second, increasing the organic matter content to bind the soil particles together; third, using methods of tillage to check the velocity of the run-off and to cause greater absorption; and fourth, by terraces and hillside ditches, thus modifying the steepness of the slope, and conducting the surplus water off at such slope as will produce little or no washing.

1. Cover Crops.—In the management of rolling land a rotation should be adopted that permits the land to be in pasture and meadow for a large part of the time, or that at least keeps a covering of vegetation on the soil so much of the time as possible. Before these rolling and hilly lands were brought under cultivation they were largely covered with vegetation of some form. The leaves of trees and fallen branches, together with the smaller perennial, biennial, and annual plants, formed a covering that very effectually prevented the soil from washing. The rainfall was held by the layer of leaves and mold and the run-off was given off slowly to the streams. As soon as the protecting forest was removed the run-off was materially increased, the water running off in a flood almost as fast as it fell. The upland timber soils of the state were usually in poor physical condition to begin with, or became so after a few years of cropping, and this condition allows only comparatively slow percolation. The soils should be kept covered with vegetation as much as possible. If a cultivated crop is grown such as corn, a cover crop should be grown in the corn to protect the soil from washing during fall, winter, and spring. This crop can be put in just before or after the last cultivation. Rye is one of the best, because it lives through the winter and makes a fair growth of top and an abundance of fine fibrous roots that hold the soil particles in place. It may be left

for green manure or pasture in the spring. Cowpeas may be used with fair success, especially in the southern part of the state, but they do not have the binding power of rye and are killed by frost. Clover, either red or alsike, may make sufficient growth during favorable seasons to protect the soil during winter and spring, but they are not so sure as rye unless the soil is treated or especially adapted to them. Much of this rolling land in southern Illinois is sour and must be sweetened with lime or ground limestone before clover will do its best. These legumes are very beneficial to the soil for another reason that has been mentioned before. The clover may be left as a green manure and turned under in time to plant another crop, as corn, or it may be harvested or pastured. It must always be borne in mind that a large growth of clover removes a very large amount of moisture from the soil, and when turned under as green manure in dry seasons it may leave the soil so dry that the succeeding crop will suffer.

In general, any crop may be grown that will furnish sufficient material both of top and roots to hold the soil in place. Rye and timothy seeded in the fall with red clover and alsike seeded in the spring, followed by pasturing is one of the very best methods.

2. Increasing the Organic Matter Content.—The amount of organic matter varies quite widely with the type of soil. The upland timber soils of the state have in general much less organic matter than the prairie types. The chief reason for this is the fact that the roots of prairie grasses were protected from ultimate decay by the moist soil while the leaves of the trees falling upon the surface of the ground were exposed to the air and almost complete decomposition took place. Some samples of original prairie soil have been collected and the amount of roots determined to a depth of six inches. One and one-half per cent of the weight of the soil was roots, both in black clay loam covered with tall slough grass and in brown silt loam growing the common blue stem of the prairies. This means that there were about twelve tons of roots per acre in the surface six inches of soil. Such a growth of fibrous roots is never found in the upland timber soils. The following table gives the per cent of organic matter in the surface and sub-surface strata of the principal types of timber and prairie soils of the state, calculated from the total amount of organic carbon found in those soils by the Division of Chemistry of the Experiment Station.*

Table 4.—Organic Matter of Soils.

Soil areas, soil types.	Percent of organic matter. Surface 0-7 inches.	Subsurface 7-18 inches.
Unglaciated area of Southern Illinois—		
Yellow silt loam (timber)	1.66	.59
Lower Illinois Glaciation—		
Gray silt loam (prairie)	2.36	1.06
Light-gray silt loam (timber)	1.66	.72
Yellow silt loam (timber)	1.88	.74
Lower Illinois Moraines—		
Yellow fine sandy loam (timber)	2.72	1.12
Deep Loess Areas—		
Yellow fine sandy loam (timber)	1.35	.67
Lower-Middle Illinois Glaciation—		
Brown-gray silt loam (prairie)	2.46	1.73
Middle Illinois Glaciation—		
Black clay loam (prairie)	5.42	3.05
Brown silt loam (prairie)	4.59	2.98
Gray silt loam / Yellow-gray silt loam } timber	1.98	.68
Yellow silt loam (timber)	1.35	.71
Upper Illinois Glaciation—		
Black clay loam (prairie)	7.24	4.87
Brown silt loam (prairie)	5.68	3.45
Light-gray silt loam		
Yellow-gray silt loam / Yellow silt loam } timber	2.12	.71
Pre-Iowan Glaciation—		
Brown silt loam (prairie	4.72	2 29
Light-gray silt loam		

* The percent of organic carbon was multiplied by 1,724 to determine the organic matter.

Soil areas, soil types.	Percent of organic matter Surface 0-7 inches.	Subsurface 7-18 inches.
Iowan Glaciation—		
Brown silt loam (prairie)	4.38	2.33
Light-gray silt loam		
Yellow-gray silt loam / Yellow silt loam / Yellow-gray silt looa } timber	2.14	73

Early Wisconsin Glaciation—		
Black clay loam (prairie)	7.24	3.39
Brown silt loam (prairie)	5.01	3.10
Light-gray silt loam		
Yellow-gray silt loam		
Yellow silt loam		
timber	2.11	.70
Late Wisconsin Glaciation—		
Black clay loam (prairie)	10.05	7.00
Brown silt loam (prairie)	7.17	3.53
Light-gray silt loam		
Yellow-gray silt loam		
Yellow silt loam		
timber	2.63	1.08
Average for timber soils	2.00	.76
Average for prairie soils	5.30	3.23

From the above table it will be seen that the average amount of organic matter in the surface stratum of timber soils is 2.00 per cent, while prairie soils have 5.30 per cent. The effect of organic matter on a soil is to keep it loose and in condition so it will not compact readily and to bind the finer soil particles into granules or crumbs, both of which tend to make the soil more porous. This increase of porosity gives a greater power of absorption, and in this way diminishes the amount of surface run-off and lessens the washing. Soils rich in organic matter do not wash badly because the granular structure is developed in them, and these compound particles will not be carried so readily by the water as the individual particles. In soils deficient in organic matter, a heavy rain will so compact them that but little absorption can take place. When the surface of such a soil dries it becomes very hard and forms what is commonly called a "crust." With a fair supply of organic matter in the soil it is not difficult to keep a mulch on the surface for conserving moisture.

One of the most important things in the management of the soils of rolling land is to increase the organic matter content, not only because of the effect it has in preventing washing, but also because of its value in producing good tilth, in increasing the moisture capacity, in conserving mosture, in aiding ventilation and in furnishing a supply of nitrogen for the plant. To increase the organic matter in soils it is necessary to utilize all of the vegetable matter produced. Farm manure should be turned back into the soil as soon as possible. Too often it is left piled up against the barn to rot the boards and leach away. Weeds, stubble, and corn stalks should be plowed under instead of being burned, as is

so frequently done. Crops of rye, or preferably legumes, should be grown and turned under to increase the organic content and at the same time augment the scanty supply of nitrogen in these soils. A crop of cowpeas or clover is not wasted if plowed under. The increased yield of the succeeding crops may more than pay for it. The turning under of cover crops will help increase the organic matter, but this is too slow on land that is washing. One or two entire crops in a four-year rotation should be plowed under for a time at least.

All forms of organic matter are about equally important to the soil from a physical standpoint, yet legumes are much more valuable because of the large amount of nitrogen which they contain. A ton of corn stalks contains 16 pounds of nitrogen, oat straw 12, wheat straw 10, clover 40 and cowpeas 43 pounds. The soil being deficient in nitrogen it would be much better to turn under clover and cowpeas than other forms. Even if a soil has a good store of organic matter to begin with, it does not require a great many years of cropping to reduce that stock below what it should be. A 50 bushel crop of corn requires 74 pounds of nitrogen to produce it. About 1,500 pounds of average organic matter must be decomposed and lost to the soil to provide this nitrogen. If the average amount of organic matter in the surface seven inches is 2 per cent, or 20 tons per acre, twenty-seven 50-bushel crops would require all of it to be decomposed to furnish nitrogen, provided the stalks were removed or burned. This rapid depletion of organic matter by cropping is aided materially by washing and soon reduces the soil to a condition of unproductiveness. Every means must be employed to maintain the supply. The amount of washing is proportional to the loss of organic matter. The more the soil is "run down" the more difficult it is to grow cover and soil renovating crops. (See Bulletin 115).

3. Tillage.—Probably nothing that we can do to rolling land will give greater results, either for good or bad, than the methods of tillage practiced. The farmers of Illinois have not yet learned the importance of this. The direction of plowing, planting and cultivation is usually determined only by convenience and regardless, too often, of consequences. We should learn to look not only to the present, but also to the future of our soils. Plowing is more frequently done up and down the hill in this state than in any other way. The making of dead furrows in this

direction is bad practice. Nature could not desire a better beginning for a gully. The work of one season's run-off may be sufficient to produce a gully that the next season's tillage operations does not fill, and the slight draw soon increases and becomes a source of annual trouble. The slopes should be kept as uniform as possible, to prevent any accumulation of water in draws.

On land liable to serious washing, plowing should always be done along contour lines or across slopes. In the southern states, where they have studied the problems of soil washing more than in any other region, contour plowing is universal. From Virginia to Arkansas this is the only method practiced on rolling land. The water in running across the furrows meets with more obstructions and greater resistance than in running with the furrows. Plowing up and down the hill is apt to leave small depressions between furrows in which the water will accumulate and do washing. Planting should be done across the slope. I have seen small ditches six inches or more in depth in the track of the planter a week after planting where the rows had been run up and down the hill. The corn had all been washed out by the water which had accumulated in and followed the planter track. If the corn rows had been run on contours this could not take place. Up and down hill planting allows the accumulation of water between rows, and this will form a large number of small ditches, which in the aggregate carry a large amount of material. In contour planting each row retards the movement of water down the slope, causing greater absorption. Wheat should be drilled in the same direction as the corn is planted.

While the direction of plowing is important, the depth is equally so, since this controls in large part the amount of run-off. A deep layer of loose soil will absorb a considerable rainfall without run-off. Five inches of such soil will readily absorb one inch of rainfall. Deep plowing mixes the organic matter with the soil to considerable depth, thus keeping it loose, so that the water will penetrate it quite rapidly.

4. Terraces and Hillside Ditches.—In the southern states it is a somewhat common practice to terrace the slopes, the kind of terraces depending upon the character of the soil and subsoil. Where the soil is pervious, such as a sandy soil, the terraces may be run on a level across the slope, but more frequently they are given sufficient fall so that the water runs along the terrace with-

out doing much washing. The water is kept on the terrace by an embankment on the lower edge. Hillside ditches are sometimes used to prevent washing. A ditch is run across the slope, with a fall sufficient to carry the water off without doing any damage. A number of these are made upon the slope, each one carrying off its share of surplus water. The distance between the ditches is determined by the slope, the steeper the slop the closer the ditches. Sometimes the hillside ditch and terrace are combined, the ditch being placed at the edge of the terrace.

If cover crops, organic matter, and deep contour plowing are used to the best advantage, probably there will be no need of terraces and hillside ditches where the rainfall is no greater than it is in this state.

I would like to quote in this connection from a letter by Professor Massey, for many years at the North Carolina Experiment Station. He says: "I attended an institute at Vienna (Johnson county) a few years ago, and was very much surprised to see the farmers plowing straight up and down the hills, and told them that this was largely the cause of the washing and was much harder on the team than contour plowing. I have cured old gullies in steep Virginia hills merely by deep subsoiling, level cultivation to prevent making dams, winter cover crops and a rotation that brings humus making crops on the land frequently. The one-horse plow and shallow plowing is responsible for the gullies in the south and up and down hill plowing in southern Illinois."

Methods of Preventing Gullying.

No form of washing will utterly ruin land more quickly than gullying. The owner of very rolling or hilly land must be on the lookout constantly for incipient gullies, and must use every means for preventing their enlargement. The fact that slopes are not uniform allows the water to accumulate in draws, thus increasing its volume and velocity and multiplying its washing power many times. Unless some means are taken to prevent it, the water soon grinds out a formidable gully.

It is a somewhat common practice to scatter straw in these draws in the fall or to build straw dams across them at frequent intervals. These serve to check the velocity of the water and catch the sediment, but frequently the run-off is so great that the straw is carried down the draw and lodges at the base. These

dams are sometimes held in place by rows of driven stakes across the draw. In general, straw is too fine to be used alone very satisfactorily. The water cannot get through it rapidly enough and so is very apt to wash the dams away or wash around the ends. A coarser material used with the straw gives better results. These means are not always satisfactory.

A better plan, used a great deal in some parts of the state, is to keep these draws in grass sod, at least until they are so well filled that there is little danger. A sod of this kind binds the soil particles together, while the top growth checks the velocity of the water, causing the sediment in suspension to be deposited. In time the draw will be filled so that it may be cropped, but it should be seeded down again if there is danger of a gully forming. This method is practiced very successfully, the grass being mowed for hay. Some farmers in renting their land have a clause in the contract forbidding the plowing of the draws. Almost any grass that forms a tough sod will answer the purpose, timothy and red-top being quite satisfactory.

Dams of earth or stone are sometimes built across draws to catch the sediment, and in many cases, depending upon conditions, this method may be very satisfactory. This plan will work better in rather broad, shallow draws possessing little fall.

In many cases the owner of the land either does not realize the importance of preventing the formation of gullies or he is careless in this respect ,and before he is aware of it deep gullies form which are very difficult to fill. Cultivation becomes impossible, and the land rapidly passes from bad to worse, and in a short time the field is abandoned. Many such are found in the unglaciated area of southern Illinois, and a very bad feature is that the number of abandoned fields is constantly increasing. The matter of filling gullies is a simple one, although it requires care and perseverance. If it is desirable to break the field up soon, and the gullies are not too deep, they may be filled with plow and scraper in a comparatively short time and with little expense. If, however, there is no immediate need for these to be filled, a different plan may be followed, and while nature made the gully she can also be induced to fill it with a little help from man. Most of the hilly and broken land of the state has been timbered and often has considerable brush growing upon it along fences and on waste places. This brush can be used to good advantage in fill-

ing these ditches, and it really looks better there than decorating fence corners. If the brush is too coarse, straw or old hay can be thrown in with it. This will catch the sediment and fill the gully. Some kind of grass should be started in the gully as soon as possible, to help catch and hold the material carried by the water. Red-top is one of the best, since it thrives under somewhat adverse conditions, forms a tough sod, and produces a large amount of top. If brush is not convenient it would be well to use any material at hand that will accomplish the result. Stumps or large stones do not answer the purpose as well as finer material, because the water will run around them and they may actually cause more washing. Old rails with straw, corn stalks, or cobs may be used, but it is well to get something growing as soon as possible, and grass is better than anything else.

The gully produced by a waterfall is one of the hardest to fill, since the fall of the water gives it great power, making it very difficult to stop its undermining action. As these generally occur where the field is in grass there is a comparatively small amount of sediment carried, and consequently the filling will go on but slowly. The recession of the fall must be stopped. Straw and brush should be used to fill in under the fall, weighting them down with stones or sod, to prevent their being washed away. Dams of brush should be put in at intervals below the fall, and even a solid dam at the edge of the field may be of much use in completely filling the gully.

Illinois is a comparatively new state, yet the ruining of land has gone on so rapidly that in some parts of the state many fields have been abandoned. In the counties of Hardin, Pope, Union, Johnson, Alexander and Pulaski, and in the counties adjoining the Wabash, Mississippi and Illinois rivers soil abandonment is already noticeable to a greater or less extent. Washing has been more detrimental in southern Illinois because the rainfall is greater and the organic matter content of the soil is less, so that most of the ruined soils are confined to that region. If this destruction of soils is as rapid in the future as it has been in the past large areas will be abandoned and depopulated in Illinois, just as they have been in the older states, for such impoverished soil will not supply the needs for even the simplest methods of living.

The outlook for the future of the rolling land is certainly not a hopeful one under the present most common systems of management, or more properly of mismanagement. Increasing poverty will be the future of the owners of this land unless a radical change in methods takes place. It is not an expensive process to protect and improve these soils, but it becomes relatively more expensive as time goes on, because the people will be less able to do it. Sad, indeed, is the prospect before the boys and girls of these lands when their only inheritance is a ruined hillside farm.

COWS TEST ASSOCIATION.

Secretary George Caven.

The importance of some movement that will induce dairymen to go more into cow testing and thus learn which of their cows are profitable and which are not, is fully appreciated by the officers of the Illinois State Dairymen's Association. A good share of the program at the Marengo convention was given over to this subject. The dairy department at the University has given thus subject much attention and for some years has had men in the field testing herds and showing dairymen the necessity of knowing just what each cow is doing.

In Michigan great advancement has been made in this line by forming cow testing associations; and these associations are proving successful. In Wisconsin also the cow testing associations are growing. The Wisconsin Dairymen's Association has one man in the field who gives all his time to the forming of these associations.

Illinois should get into the cow testing association class. There is no better way to advance dairying and teach dairymen that dairying is highly profitable if correctly followed.

To show how these associations are managed we are quoting from a bulletin recently issued by the Dairy Department of Michigan. It opens with "Some notes on co-operative cow testing in Denmark and Sweden" and follows with an explanation of the plan now being followed in Michigan. From the bulletin we take the following:

SOME NOTES ON CO-OPERATIVE COW TESTING IN DENMARK AND SWEDEN.

The first co-operative cow testing association (record association control association) was organized January 23rd, 1895, at a meeting called for that purpose on the farm of Soren Peter Knudsen, Lillie Skovgaard, Vejen, Denmark. The initiative was given by Mrs Anne Hansen, Askov, whose husband, Statsconsulent Frederik Hansen, for several years had tested the fat content of milk given by the different cows in his herd. It was done in this way that samples of the individual cow's milk were sent to the creamery for testing. It was when the farmers of that community had begun to realize what benefits Frederik Hansen received from such records that Mrs. Hansen suggested that Mr. Hansen and his neighbors should organize themselves into an association for the purpose of investigation and recording of the feeding, as well as the milk and butter fat yield of individual cows in the herds, and with those records as basis, to make the dairy industry more remunerative and to work toward the development of a strain of cows which would produce a large quantity of milk rich in butter fat.

The association commenced active operations May 1, 1895, with 12 members, and this number has been steadily increased so that the association now numbers 24 members, with a total of 522 cows, and it has become necessary to employ two men to do the testing and compiling of the records.

Later the same year another association was organized and since then new associations have been organized so fast that Denmark now has over 400 associations in operation. The degree in which the Danish farmer supported the movement can best be realized when we learn that in area Denmark is only one-fourth the size of the state of Michigan.

The following table shows the growth of the movement in Denmark, Sweden, Norway, Germany and Finland:

	Denmark.	Sweden.	Norway.	Germany.	Finland.
1895	2	...	...	...	...
1896	13	...	...	...	...
1897	15	...	...	1	...
1898	58	1	1	...	1
1899	82	7	5	1	1
1900	49	20	13	1	...
1901	41	42	46	5	1
1902	47	66	42	9	3
1903	55	51	30	11	5
1904	28	86	23	34	10
Total	390	273	163	63	20

Government Assistance.

Since May 23, 1902, the Danish government has given the work financial assistance. Each year the sum of $32,000 is appropriated to be distributed in portions of not more than $66.00 to any one association, the association to have not less than 200 cows. The government also aids indirectly by offering prizes for the best animals and encourages improvement in dairy cattle by a liberal appropriation for the purpose of aiding bull associations which are a natural outgrowth of the cow testing associations.

The Swedish government aids the movement by contributing yearly as follows:

Associations.	The first 3 years.	The following years.
With less than 250 cows	$53.00	$40.00
250 to 300	47.00	33.00
300 to 350	40.00	27.00
350 to 400	33.00	20.00
400 to 450	27.00	13.00
450 to 500	20.00	7.00

The Control Assistants.

The assistants, or the men that do the weighing and calculation of the milk, butter, feed, etc., in the associations, are men that have had especial training for that purpose. The agricultural schools in Denmark conduct every year special courses of from two or four months, for the purpose of giving instructions to cow testers. Before entering these courses, the students must have had practical experience in the feeding and care of dairy cattle, and must have had such experience in veterinary science, milking, breeding, etc., that they are able to give advice to the

dairymen. The educational effect of a college course, together with one or two years' work in a cow testing association, has proved such that those men are in general demand as managers of large dairies, creameries, etc., and they are frequently found in leading positions connected with the dairy work.

The Work of the Assistants.

The assistants make periodical visits to the farm of each member of the association, and spend a day at each place. If the association has 12 members, the testing is done every fourteenth day, and if there are 26 members, and one herd can be tested a day, the testing will be done once a month, making due allowance for Sundays. In every herd of 40 or less cows, the work can be done in a day. If the number of cows in a herd is greater than 40, two days are necessary. On the other hand, if the farms are located close together and the herds are not too large, two herds may be tested in a day.

The milk from each cow is carefully weighed, sampled and tested, both night and morning. From the data obtained in this way, the monthly yield is calculated. In the same way the number of pounds of feed and the cost of same is computed for each cow. These details are entered into a book kept for that purpose. Thus at the end of the year, the farmer will have a complete record of every cow in his herd, and with this as a basis, he can make intelligent selection of cows for breeding purposes.

Some of the Results.

The first aim of the associations has been to make dairying yield better returns and to increase the interest in dairying. Through an accurate record of the yield and feed consumed, the dairyman has an opportunity to judge as to the present profitableness of his herd and as these records, when compared with others, at the same time, show where improvement might be made, they become of great importance. The problem is, then, to avoid the mistakes of the past and to make such improvements as are needed, and the records may suggest.

The following table shows the improvement made in one herd of the Wallakra (Sweden) cow testing association by seven years' testing:

Herd B., owned by Aug. Kinck, Beltaberga, Sweden.

Testing period—365 days.	Average number of cows.	Average feed-units per cow.	Average number of lbs. milk per cow.	Average test.	Average number of lbs. butter per cow.	100 feed-units gave	
						Lbs. milk.	Lbs. butter.
1899-1900.....	70	2,421	7'320	3.05	245	302	10.1
1900-1901....	28	2,695	7,905	3.13	272	293	10.1
1901-1902.....	46	2,566	9,003	3.20	317	350	12.3
1902-1903.....	55	2,507	9,984	3.18	350	398	13.9
1903-1904.....	61	2,587	10,584	3.22	376	407	14.5
1904-1905.....	64	2,743	11,236	3.22	399	409	14.5
1905-1906.....	71	3,035	11,333	3.21	401	372	13.2
Increase.....	......	614	4,016	......	156	70	3.1

Let us stop and think what this means. Figuring the butter at 22.2 cents per pound, it means that Mr. Aug. Kinck in 1906 received $2,558.82 more from his herd than he did in 1900 when he joined the association. In ten years this would amount to $25,588.20. These results were accomplished through judicious feeding, weeding and breeding, and shows what may be attained if the lessons taught by the records of the herds are put into practical use.

The increase in the feed units consumed during the last two years was undoubtedly due to the extremely dry summers, when it became necessary to give the cows additional concentrated feed. Had this not been necessary, the economic results would have been still better.

1. Swedish feed unit equals 2.3 lbs. bran, or
2.2 lbs. mixed grain, or
1.8 lbs. oil cake, or
3.3 lbs. dried beet pulp, or
5.5 lbs. clover hay, or
8.8 lbs. oatstraw, or
2.2 lbs. beets, or
36 lbs. ensilage, or
17 lbs. green clover.

Record of all the cows in Wallakra Cow Testing Association for the first seven years of its existence:

	Average number of feed units per cow.	Average nnmber of lbs. milk per cow.	Average test.	Average number lbs. butter per cow.	100 feed units gave	
					Lbs. milk	Lbs. butter
1st year	2,374	6,702	3.09	227	282	9.6
2d year	2,409	6,618	3.19	231	280	9.6
3d year	2.390	7,482	3.20	264	313	11.0
4th year	2.302	7,965	3.20	280	346	12.2
5th year	2,334	8.132	3 24	291	348	12.4
6th year	2,435	8,765	3.21	310	359	12.7
7th year	2,536	8,602	3.20	304	340	12.0
Increase	162	1,900	....	77	58	2.4

By comparing this table with the preceding one, it will be seen that the feed units per cow increased materially during the last two years. This was undoubtedly due to the extremely dry summers.

By comparing this table with the preceding one, it will be herds with the increase of production of Herd B, which was one of the herds in the association, one would naturally infer that some of the other members of the association did not as extensively put into practice the lessons taught by the records. And just therein is a lesson, namely, that it does a man little good to have dairy knowledge, unless he puts that knowledge into practical use. Yet, figuring the butter at 22.2 cents, the income per cow has been increased $17.07 more than it was during the first year the association was operated.

And these results are not exceptions. In fact all the older associations show a steady increase in yield as well as improvement in economic production.

The following table shows what systematically kept records will accomplish in the line of milk yield. The milk production of 1,172 herds on the island of Fyen, Denmark, is found to be as follows:

Some of the Results.

Yield from	2 herds averages	3,300 to 4,400 lbs.
	21	4,400 to 5,500
	135	5,500 to 6,600
	386	6,600 to 7,700
	438	7,700 to 8,800
	158	8,800 to 9,900
	27	9,900 to 11,000
	5	11,000 and over.

These herds were regular herds as they were found in the country and do not include any "fancy" herds.

The Work Extended.

Recently many of the associations have found the system of keeping records so instructive and profitable that it has been extended to include other branches of farming, such as the raising of young stock, horses, hogs, poultry, and the growing of crops.

CO-OPERATIVE COW TESTING ASSOCIATIONS IN MICHIGAN.

Since the enactment of the new dairy law of 1905, which makes it the duty of the Dairy and Food Department to foster and encourage the dairy industry, numerous dairies have been visited by the inspection force. This has been done with the view not only of investigating the sanitary conditions under which milk is produced, but also to ascertain if possible the economic condition of the dairy business.

The reports of the inspectors show that only in isolated cases did the dairyman know how much his herd brought him in a year. Very few farmers had Babcock testers, and the majority of those who did have testers did not use them. In exceptional cases the cost of the feed was estimated. Where records have been obtained by the inspector, their procedure has been, either to add up the returns from the creamery or cheese factory as shown by the monthly statements furnished by them to their patrons, or to go to the factory and copy those monthly returns from the books. After securing this data, the inspector ascertained from the farmer how many cows were kept during that period, and by dividing the returns by the number of cows kept, the gross receipts per cow were calculated. While some of the records showed large profits, the great majority did not. The gross returns in a year were in many instances as low as $19.00 for each cow in the herd.

These and much other data would indicate that there is a wide field for improvement of the dairy cattle in Michigan in point of performance. If a dairyman wishes to improve the productiveness of his herd, there is only one way of doing it, provided they are properly fed and cared for, namely, to weed out the poor producers and replace them with profitable cows. Such, however, are rarely found on the market except at very high prices, and the average dairyman will find that if he wants good cows, he will have to raise them himself. The best method he can adopt then is to secure a good sire with dairy qualities and raise the calves of his best cows, and with them replace the cows that have proved unprofitable.

But in order to do this, he must be able to tell the good cows from the poor ones. He must know three things about every individual. First how much milk will she give in a day or a month. He must know how much she gives in a year, because he must feed her a year.

Second, he must know the richness of the milk in order to determine its market value. The richer it is in fat, the greater its market value.

Third, he must know how much it costs to keep the cow a year. This factor is just as important as it is to know the yield of milk and the richness of it, for it is the net profit that makes a cow valuable.

He must put in operation on his farm a system that will enable him to determine these three factors about every cow in his herd. This has been advocated for years in this country, and yet very little progress has been made. The average dairyman has so many things to do that he has not the time to do this systematically. And it must be done systematically to be of any value. Co-operation can accomplish what is not practical with the individual.

This Department believes that the cheapest and most effective way of doing this is by organizing co-operative cow testing associations, and on the 26th of September, 1905, assisted in organizing the first association of that kind in Fremont, Newaygo county. It was not only the first in Michigan, but the first in America. It has now started on its second year, and the results of the first year's test will be found in the pages of this bulletin.

The first of February, 1907, another association commenced operations at Coopersville, Ottawa county, and since then associations have been organized at Bay City, Caro and Lapeer. The indications are that many more will be organized in the near future. In the operation of these associations we have copied after those in operation in the intensive dairy districts of the old world. It is generally recognized that the high position those countries occupy in dairying has been reached through these co-operative efforts more than through any other one thing. It is believed that nothing could be done by this Department which would be of more benefit to the dairy farmer than to render all assistance possible in the organization of cow testing associations in every dairy community in the state.

Practical Workings of the Association.

A few farmers in a community owning a sufficient number of cows simply meet and organize under the laws of the state, elect officers and hire a competent man to do the testing. The expense is to be paid pro rata by each man in proportion to the number of cows he owns. It is desirable to have a sufficient number of cows in the association so that the expense will not exceed $1 to $1.50 per cow a year. The tester visits one herd a day. He arrives in the afternoon, sees the cows milked, weighs the milk, takes a sample from each cow, weighs the cow's milk, estimates the feed and the cost, both night and morning. Then he tests the milk of each cow and figures out the cost of the ration, leaving a record for the farmer. This farmer then takes him and his outfit to the next farmer, and so on. He gets to each farm every month, so that a farmer has monthly records each year At the end of the year, the tester figures up the yield of milk and butter fat and the value of the same, the cost of feed to maintain each cow a year, and figures out the profit or loss on each individual in the herd, and furnishes every patron with this complete record. What dairyman in Michigan can afford to be without this knowledge of his dairy herd when the expense will not exceed $1 or $1.50 per cow? Suppose a man should come to you and say that he would tell you just exactly how much profit you were making on each cow for $1 or $1.50. Would you not think it a bargain to accept the proposition? And yet this is just what a co-operative cow testing association offers to every man.

The Method of Calculation.

The yield of milk and butter fat for a year is calculated from the monthly records. These again are obtained by multiplying the yield for the day the cow was tested with the number of days in the month. To determine how closely such records would agree with the actual yield, numerous experiments have been made. As a result of these it has been found that the milk yield calculated in this way does not vary on an average more than six pounds, and the butter yield not more than four pounds per hundred pounds when compared with the actual yield.

It will be seen from the records that the average price received for butter fat varies with the different individuals, although the butter was manufactured in the same creamery. The price received for butter fat seems to be dependent on when the cow was fresh. Thus it will be noticed that when a cow came in during the fall months, she gave the largest flow of milk during the winter months, when butter fat brought the highest price, and gave the least milk during the hottest weather, when butter was the cheapest and when the farmer had the least time to care for her properly. Cows that came in during the spring months gave the most milk when butter was cheap and had a tendency to go dry during the cold months. This would indicate the advisability of having the cows come fresh in the fall. The price is based on the returns from the creamery.

The cost of feed is based on the local markets, and varies with the different herds, due undoubtedly to the degree of forethought employed in buying at times of the year when feed was cheapest. In figuring the cost of pasture more consideration has been given to the quality of the pasture during the various months than to the value of the land.

Heifers with first calf have not been charged for feed until after they have calved.

In determining the total profit, it has been assumed that the calf, the skim milk, and the manure from each cow would pay for the labor in feeding and caring for her.

The last column, "Cost to produce one pound butter fat," is an important one. Too little attention has been paid to this part of individual records in the past. It is not enough to produce a large number of pounds of butter fat. It must be produced economically. Profit is what brings success.

Leading dairymen are beginning to realize that the best cow is the one that gives the largest returns for the same amount of feed regardless of the cost of the same. The dairymen of the old world recognize this point when they determine the amount of milk or butter the cow gives for every 100 feed units she consumes.

During the past year the associations have not been able to make comparisons between the different cows in this respect, but expect to do so in the future.

Following are records of some of the herds in the first year's test, which records show just the information gained in the cow testing associations:

Herd A.

Number of cow	Months in test	Age of cow, years	When fresh	Lbs. milk during testing period	Average test	Lbs. butterfat during testing period.	Average price of butterfat in cts.	Value of butter-fat	Lbs. timothy hay	Lbs. oatstraw	Lbs. carrots	Lbs. cornstalks	Days pasture	Lbs. cornmeal	Lbs. corn and cob meal	Lbs. linseed meal	Lbs. ground oats	Cost of roughage	Cost of grain	Total cost of feed	Total profit	Returns for $1 expended	Cost to produce 1 lb. butterfat, cents.	Remarks
1...	11	3	Feb., '06	3,694	3 80	140	22.4	$31 46	950	290	260	1,160	194	124	50	12	31	$16 02	$1 29	$17 31	$14 15	$1 82	12.3	
2	11	3	Mar., '06	3,425	3 96	146	22 4	32 63	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	15 32	1 88	11 8	
3...	11	5	June, '06	3,635	3 84	140	21 7	30 37	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	13 06	1 75	12.4	
4..	11	9	Nov., '05	3,652	4 50	145	23.0	38 08	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	20 77	2 20	10 5	
5...	11	6	Jan., '06	3,717	4 16	154	22.6	34 94	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	17 63	2 02	11.2	
6...	11	3	Nov., '06	941	3 70	35	27 0	9 39	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	......	54	49.7	Loss, $7.92
7...	11	6	Jan., '06	3,932	3.94	155	23 0	35 62	950	290	26	1,160	194	124	50	12	31	16 02	1 29	17 31	18 31	2 06	11.2	
8...	11	3	Mar., '06	1,867	4 04	76	21 9	16 52	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	......	95	23.0	Loss, $0 79
9..	11	3	Jan., '06	2,769	4.29	119	22 0	26 53	950	290	260	1,160	194	124	50	12	31	16 02	1 29	17 31	9 22	1 53	14 6	
Totals for the testing period..............				27,632	4 08	1,130	22 7	$255 54	8,550	2,610	2,340	10,440	....	1,116	450	108	279	$144 18	$11 61	$155 79	$99 75	$1 64	13 8	
Est. av. per cow for 12 months				3,349	4 08	137	22.7	$30 97	1,036	316	284	1,265	....	135	55	13	34	$17 47	$1 41	$18 88	$12 09	$1 64	13 8	

Breed: Mixed.
Average price of timothy hay per ton, $5.00
Average price of cornmeal per ton, $10.00.
Average price of oat straw per ton, $3.00.
Average price of corn and cob meal per ton, $8.
Average price of carrots per ton, $1.2.00.
Average price of linseed meal per ton, $31.00.
Average price of cornstalks per ton, $3.50.
Average price ground oats per ton, $20.00.
Pasture for May, per month, $1.50.
Pasture for June, July, August, September, per month, $2.00.
Pasture for October, per month, $1.20.

Herd B.

Number of cow	Months in test	Age of cow, years	When fresh	Lbs. milk during testing period	Average test	Lbs. butterfat during testing period	Average price of butterfat in cents	Value of butterfat	Lbs. carrots	Lbs. ensilage	Lbs. mixed hay	Lbs. cornstalks	Days' pasture	Lbs. wheat middlings	Lbs. cornmeal	Lbs. ground oats	Lbs. oil meal	Lbs. cottonseed meal	Cost of roughage	Cost of grain	Total cost of feed	Total profits	Returns for $1 expended	Cost to produce 1 lb. butterfat, cents	Remarks
1	11	6	Apr., '06	6,242	3.28	205	21.2	$43.37	177	5,500	850	950	183	15	110	72	14	88	$21.95	$3.71	$25.66	$17.71	$1.69	12.5	
2	11	3	Sep., '05	5,186	3.80	197	23.4	46.24	177	5,700	860	900	183	41	177	200	14	200	22.16	7.52	29.09	16.56	1.50	15.0	
3	4	4	Aug., '05	513	4.31	22	26.3	5.81	177	2,950	860	...	31	20	70	120	14	90	7.81	3.32	11.18	.....	.52	50.3	Loss $.32. Sold.
4	11	4	Aug., '06	4,185	4.21	176	24.1	42.44	177	5,500	850	900	183	20	133	146	14	212	21.95	6.33	28.28	14.16	1.50	16.0	
5	11	6	July, '06	4,129	4.15	171	24.7	42.42	177	5,500	850	900	183	36	161	180	26	140	21.95	6.24	28.19	14.23	1.50	16.4	
6	11	4	Apr., '06	5,912	4.09	242	21.9	52.99	177	5,700	860	900	183	35	128	135	26	119	22.16	4.96	27.12	25.87	1.96	11.2	
7	11	4	Aug., '06	5,488	4.09	224	24.1	54.03	177	5,500	850	900	183	41	167	171	32	169	21.95	6.81	28.76	25.7	1.89	12.8	
8	11	9	Jan., '06	5,156	4.25	219	22.5	49.30	177	5,700	860	900	183	41	134	167	26	144	22.16	5.75	?27.91	21.39	1.79	12.7	
9	9	2	Apr., '06	3,964	3.87	153	21.4	32.80	...	3,600	270	900	183	..	60	97	..	36	17.92	1.92	19.84	12.96	1.65	12.9	
10	9	2	Apr., 06	5,311	3.73	198	22.2	44.08	...	3,600	270	900	183	..	92	140	..	97	18.10	3.88	21.98	22.10	2.01	11.1	
11	7	3	Jun., '06	4,421	3.98	176	21.2	37.45	...	2,000	...	900	152	..	62	62	..	62	14.64	2.20	16.84	20.61	2.22	9.5	Bought..
12	3	3	Nov., '06	1,933	3.60	70	25.8	18.04	...	2,900	...	800	...	..	69	69	..	69	5.32	2.56	7.88	10.16	2.29	11.3	Bought..
Totals for testing period				52,440	3.91	2053	22.8	$468.97	1416	54750	7380	9850	...	249	1363	1559	166	1426	$218.07	$55.20	$273.27	$195.70	$1.71	13.3	
Est. av. per cow for 12 months				5,773	3.91	226	22.8	$51.63	156	6,$27	812	1084	...	27	150	171	18	157	$24.00	$6.08	$30.08	$21.54	$1.71	13.3	

Breed: Durham grades and mixed.
Average price of carrots per ton, $8.00.
Average price of ensilage per ton, $2.25.
Average price of mixed hay per ton, $5.00.
Average price of cornstalks per ton, $3.50.
Average price of wheat middlings per ton, $20.00.
Average price of cornmeal per ton, $20.00.
Average price of ground oats per ton, $20.00.
Average price of oilmeal per ton, $$30.00.
Average price of cottonseedmeal per ton, $29.00.
Pasture for May, June, July, August, September, per month, $2.00.
Pasture for October, per month, $1.20.

Herd C.

No. of Cow	Months in test.	Age of cow, years.	When fresh.	Lbs. milk during testing period.	Average test..	Lbs. butterfat during testing period.	Average price of butter fat in cents.	Value of butterfat.	Lbs. cornstalks.	Lbs. mixed hay.	Days pasture.	**Lbs. corn (in the ear.)**	Cost of roughage.	Cost of grain.	Total cost fo feed.	Total profit..	Returns for $1 ex-pended.	Cost of 1 lb. butterfat, cents.	Remarks.
1	11	7	Feb., '06	6,975	3.57	249.3	22.7	$56.61	590	2,000	198	849	$19.28	$3.82	$23.10	$33.51	$2.45	9.3	
2	11	4	Apr., '06	8,448	4.00	338.1	21.7	73.34	590	2,000	198	820	19.28	3.70	22.98	50.36	3.19	6.7	
3	11	5	Jan., '05	6,087	3.72	226.6	22.3	50.45	590	2,000	198	731	19.28	3.28	22.56	27.89	2.24	9.9	
4	9	10	Nov., '05	3,795	3.72	141.0	22.7	31.98	280	1,625	198	40	17.42	.18	17.60	14.38	1.82	12.5	
5	11	3	Jan., '06	4,550	4.33	196.8	23.1	45.52	590	2,000	198	849	19.28	3.82	23.10	22.42	197	11.7	Sold.
Totals for testing perior..				29,855	3.86	1,151	22.4	$257.90	2,640	9,625	...	3,289	$94.54	$14.80	$109.34	$148.56	$2.36	9.5	
Est. av. per cow for 12 mths.				6,760	3.86	261.0	22.4	$58.39	598	2,178	...	745	$21.41	$3.35	$24.76	$33.63	$2.36	9.5	

Breed: Mixed.
Average price of cornstalks per ton, $3.00.
Average price of mixed hay per ton, $6.27.
Average price of corn (in the ear) per ton, $9.00.
Pasture for May, June, July, August, September, per month, $2.00.
Pasture for April, October, $$1.20.

Herd D

Number of cow.	Months in test.	Age of cow, years.	When fresh.	Lbs. milk during testing period.	Average test.	Lbs. butterfat during testing period..	Average price of butterfat, cents.	Value of butterfat..	Lbs. beets.	Lbs. cornfodder	Lbs. clover hay.	Lbs. mixed hay. .	Days pasture..	Lbs. corn (in ear.)	Lbs. ground oats.	Cost of roughage.	Cost of grain.	Total cost of feed.	Total profit.	Returns for $1 expended	Cost to produce 1 lb. butterfat, cents.	Remarks.
1..	8	10	Dec., '05	3,325	4.20	140	22.2	$30.94	3,050	710	600	300	174	...	...	$18.38	.....	$18.38	$12.56	$1.68	13.2	Gave milk from 2 teats only. Sold
2..	11	6	Dec., '05	6,269	4.03	253	23.7	59.84	4,900	1000	900	500	203	60	150	23.69	$1.80	25.49	34.35	2.35	10.1	
3..	11	5	Sep., '05	6,171	4.05	250	23.0	57.50	4,200	1000	900	500	203	60	150	23.42	1.80	25.22	32.28	2.28	10.1	
4..	10	8	Feb., '06	3,170	4.90	156	21.7	33.80	1,900	700	600	500	203	...	...	18.91	.....	18.91	14.89	1.79	12.2	Bought.
5..	4	7	May, '06	3,098	3.78	117	19.3	22.64	....	...	...	...	118	...	...	7.74	.....	7.74	14.90	2.92	6.6	Gave bloody milk. (Sold.
Totals for testing period				22,033	4.16	916	22.3	$204.72	14,050	3410	3000	1800	...	120	300	$92.14	$3.60	$95.74	$108.98	$2.14	10.4	
Est. av.. per cow for 12 months				6,009	4.16	250	22.3	$55.83	4,215	1023	900	540	...	36	90	$25.13	$0.98	$26.11	$29.72	$2.14	10.4	

Breed: Mixed.
Average price of beets per ton, $3.00.
Average price of cornfodder per ton, $3.00.
Average price of clover hay per ton, $5.00.
Average price of mixed hay per ton, $5.00.
Average price of corn (in the ear) per ton, $10.00.
Average price of ground oats per ton, $20.00.
Pasture for May, June, July, August, September, per month, $2.00.
Pasture for April, October, per month, $1.20.

Herd E.

Number of cow	Months in test.	Age of cow, years.	When fresh.	Lbs. milk during testing period.	Average test..	Lbs. butterfat during testing period.	Average price of butter-fat in cents.	Value of butterfat.	Lbs. cornfodder..	Lbs. clover hay.	Lbs. mixed hay..	Lbs. beets.	Days pasture.	Lbs. cornmeal.	Lbs. ground oats.	Cost of roughage.	Cost of grain.	Total cost of feed.	Total profit.	Returns for $1 expended	Cost to produce 1 lb. butterfat, cents.
1	11	4	Feb., '06	6,078	3.87	236	22.4	$52.78	2,200	1,300	250	...	183	100	32	$18.53	$1.32	$19.85	$32.93	$2.66	8.4
2	11	7	June, '06	4,997	3.70	185	21.9	40.57	2,200	1,300	155	250	183	...	..	18.83	....	18.83	21.75	2.05	10.2
3	11	5	Mar., '06	4,541	3.77	171	21.9	37.51	2,200	1,300	155	250	183	100	32	18.83	1.32	20.15	17.36	1.86	11.8
4	11	8	Apr., '06	5,269	3.70	195	21.6	42.30	2,200	1,300	155	250	183	100	32	18.83	1.32	20.15	22.15	2.10	10.3
Totals for testing .period..				20,885	3.77	787	21.9	$173.16	8,800	5,200	715	750	...	300	96	$75.02	$3.96	$78.98	$94.18	$2.19	10.0
Est. av. per cow, 12 months..				5,695	3.77	215	21.9	$47.22	2,400	1,418	195	205	...	82	26	$20.46	$1.08	$21.54	$25.68	$2.19	10.0

Breed: Mixed.
Average price of cornfodder per ton, $3.00.
Average price of clover hay per ton, $5.00.
Average price of mixed hay per ton, $8.00.
Average prce of beets per ton, $2.50.
Average price of cornmeal per ton, $20.00.
Average price of ground oats per ton, $20.00.
Pasture for May, June, July, August, September, per month, $2.00.
Pasture for October, per month, $1.20.

Herd F.

Number of cows.	Months in test.	When fresh.	Lbs. milk during testing period.	Average test.	Lbs. butterfat.	Average price of butter-fat, cents.	Value of butterfat.	Lbs. ensilage.	Lbs. cornfodder.	Lbs. mixed hay.	Days pasture.	Lbs. wheat bran..	Lbs. wheat middlings.	Lbs. linseed meal.	Cost of roughage.	Cost of grain.	Total cost of feed.	Total profit.	Returns for $1 expended	Cost to produce 1 lb. butterfat, cents.	Remarks.
1..	12..	June, '06	4,362	3.71	162	23.0	$37.30	5,850	300	1,500	183	300	...	...	$24.10	$4.15	$28.25	$9.05	$1.32	17.5	
2..	6..	Nov., '05	1,953	3.95	77	25.3	19.46	3,500	...	1,500	30	360	90	10	11.83	5.53	17.36	2.10	1.12	22.5	Sold.
3..	12..	July, '06	2,963	4.25	126	23.1	29.14	5,850	300	1,500	183	350	...	...	24.10	4.13	28.23	.91	1.03	22.4	
4..	12..	Apr., '06	5,150	3.77	194	22.7	44.10	5,850	300	1,500	183	470	...	10	24.10	5.72	29.82	14.28	1.48	15.4	
5..	12..	June, 06	4,213	3.34	141	22.8	32.09	5,850	300	1,500	183	350	...	...	24.10	4.13	28.23	3.86	1.14	20.0	
6..	12..	Jan., '06	4,980	4.24	211	23.6	49.70	3,550	300	1,500	183	650	200	10	20.83	9.92	30.75	18.95	1.61	14.6	
7..	6..	Jun., '05	545	5.14	28	25.8	7.22	3,550	...	1,500	30	...	...	...	11.93	....	11.93	....	.65	42.6	Loss $4.71. (Sold
8..	12..	Nov. '05	4,213	3.49	147	23.0	33.86	4,000	300	1,500	183	580	200	10	21.63	9.26	30.89	2.97	1.09	21.0	
9..	12..	Dec., '05	4,406	4.00	176	24.5	43.10	3,540	300	1,500	183	520	200	10	20.83	8.54	29.37	13.73	1.46	16.7	
10..	12..	Dec., '05	4,553	3.71	169	23.6	39.86	3,550	300	1,500	183	520	200	10	20.83	8.54	29.37	10.49	1.36	17.4	
11..	12..	Jan.,'06	4,301	3.63	156	23.4	36.48	3,550	300	1,500	183	520	200	10	20.83	8.54	29.37	7.11	1.24	18.8	
12..	12..	Mar., '06	4,656	3,82	178	23.0	40.96	5,850	300	1,500	183	735	200	10	24.10	10.89	34.99	5.97	1.17	19.6	
13..	6..	Jan. '06	2,072	3.57	74	25.5	18.85	3,550	...	1,500	30	375	200	10	11.83	6.74	18.57	.28	1.01	25.0	Sold.
15..	12..	Feb., '06	4,817	3.78	182	23.0	41.91	4,800	400	1,500	183	750	200	10	22.77	11.10	33.87	8.04	1.23	18.6	
16..	12..	Feb., '06	4,471	4.29	192	23.3	44.60	4,000	300	1,500	183	600	200	10	21.63	9.26	30.89	13.71	1.44	16.1	
17..	12..	Mar., '06	4,419	4.28	189	23.1	43.61	5,850	300	1,500	183	735	200	10	24.10	10.89	34.99	8.62	1.25	18.5	
18..	4..	Sept.,'06	2,019	4.06	82	24.9	20.31	2,300	300	...	60	210	...	...	6.27	2.33	8.60	11.71	2.31	10.5	Bought.
19..	4..	....	955	5.04	48	25.3	12.05	2,300	300	...	40	210	...	...	5.87	2.23	8.10	3.95	1.49	17.0	Bought.
Totals for testing period			65,048	3.89	2,532	23.5	594.60	77,290	4,600	24,000	...	8295	2,090	120	341.68	121.90	463.58	131.02	$1.28	18.3	
Est. av. per cow for 12 months ...			4.290	3.89	167	23.5	$39.20	5,096	303	1,582	...	547	138	8	$22.53	$8.03	$30.56	$8.64	$1.28	18.3	

Breed: Mixed.
Average price of ensilage per ton, $3.00.
Average price of cornfodder per ton, $4.00.
Average price of mixed hay per ton, $6.00.
Average price of wheat bran per ton, $23.550.
Average price of wheat bran per ton, $23.50.
Average price of linseed meal per ton, $31.00.
Pasture for June, July, August, September, per month, $2.00.
Pasture for October, November, per month, $1.20.

Herd G.

Number of cow..	Months in test.	Age of cow, years.	When fresh.	Lbs. milk during testing period.	Average test..	Lbs. butterfat during testing period.	Average price of butter-fat, cents.	Value of butterfat.	Lbs. corn fodder.	Lbs. clover hay.	Days pasture.	Lbs. ground oats.	Lbs. cornmeal.	Lbs. Linseed meal.	Cost of roughage.	Cost of grain.	Total cost of feed.	Total profit.	Returns for $1 expended	Cost to produce 1 lb. butter fat, cents.	Remarks..
1..	12	6	Dec., '05	6,800	4.03	274	23.9	$65.51	2,100	1,600	183	375	725	24	$17.46	$9.97	$27.43	$38.08	$2.39	10.0	
2..	12	5	Dec., '05	6,588	4.05	267	23.6	62.85	2,800	1,550	183	300	700	..	18.26	8.51	26.77	36.08	2.35	10.0	
3..	5	9	May, '05	235	4.92	12	25.8	2.91	1,550	1,600	...	125	220	..	6.66	2.99	9.65	.....	.30	83.2	Loss $6.74. Calved May '06. Died milk fever.
4..	12	2½	July, '06	3,426	3.87	132	23.9	31.72	600	2,000	200	270	270	30	13.10	5.08	18.18	13.54	1.74	13.7	
Totals for testing Period				17,049	4.02	685	23.8	$162.99	7,050	6,750	...	1070	1915	54	$55.48	$26.55	$82.03	$80.96	$1.99	11.9	
Est. av. per cow for 12 months				4,990	4.92	200	23.8	$47.70	2,063	1,975	...	313	560	16	$16.24	$7.77	$24.01	$23.69	$1.99	11.9	

Breed: Mixed.
Average price of cornfodder per ton, $3.40.
Average price of clover hay per ton, $5.00.
Average price of ground oats per ton, $20.00.
Average price of cornmeal per ton, $16.00.
Average price of linseed meal per ton, $32.00.
Pasture for July, August, September, per month, $2.00.
Pasture for June, per month, $1.50.
Pasture for October, November, per month, $1.20.

Herd H.

Number of cow.	Months in test.	Age of cow, years.	When fresh.	Lbs. milk during testing period.	Average test.	Lbs. butterfat during testing period.	Average price of butterfat, cents.	Value of butterfat.	Lbs. cornfodder.	Lbs. clover hay.	Days pasture.	Lbs. bran.	Lbs. cornmeal.	Lbs. oilmeal.	Cost of roughage.	Cost of grain.	Total cost of feed.	Total profit.	Returns for $1 expended.	Cost to produce 1 lb. butterfat, cents.	Remarks.
1..	12	4	Sept., '06	5,689	4.78	272	23.9	$64.98	2,100	1,200	183	500	700	350	$18.11	$15.50	$33.61	$31.37	$1.93	12.3	
2..	12	8	Oct., '05-6	7,580	3.66	278	24.2	67.18	2,000	1,200	183	350	790	480	17.61	18.06	35.67	31.51	1.88	12.9	
3..	10	3	Sept., '06	2,655	4.36	116	23.6	27.32	1,200	1,250	153	62	467	230	15.33	8.16	23.49	3.83	1.16	20.3	Sold.
4..	12	7	Oct., '05	7,122	3.68	263	23.6	62.05	2,050	1,230	183	330	775	400	18.01	16.23	34.24	27.81	1.80	13.1	
5..	12	6	Nov., '05	6,166	4.26	263	23.5	61.72	2,000	1,200	183	300	820	380	17.61	16.30	33.91	27.81	1.82	12.9	
6..	12	..	Jan., '06	8,518	3.76	320	23.3	74.73	2,200	1,200	183	335	670	330	18.01	14.40	32.41	42.32	2.31	10.1	
Totals for testing period				37,730	4.00	1,512	23.7	$357.98	11,550	7,280	...	1,877	4,222	2,170	$104.68	$88.65	$193.33	$164.65	$1.85	12.8	
Est. av. per cow for 12 mos......				6,468	4.00	259	23.7	$6.37	1.980	1,248	...	321	723	372	$17.94	$15.20	$33.14	$28.23	$1.85	12.8	

Breed: Jersey grades and mixed.
Average price of cornfodder per ton, $3.75.
Average price of clover hay per ton, $6.00.
Average price of bran per ton, $20.00.
Average price of cornmeal per ton, $18.00.
Average price of oilmeal per ton, $31.00.
Pasture for June, July, August, September, per month, $2.00
Pasture for October, November, per month, $1.20.

Illinois Dairy and Food Laws.

In Force July 1, 1907

An Act to prevent fraud in the sale of dairy products, their imitation or substitutes, to prohibit and prevent the manufacture and sale of unhealthful, adulterated or misbranded food, liquors or dairy products, to provide for the appointment of a State Food Commissioner and his assistants to define their powers and duties and to repeal all acts relating to the production, manufacture and sale of dairy and food products and liquors in conflict herewith.

Section 1. Be it enacted by the People of the State of Illinois, represented in the General Assembly:

Provision for appointment of a State Food Commissioner and the establishment of a State Food Department. That the Governor shall appoint a commissioner, who shall be known as the State Food Commissioner, who shall be a citizen of the State of Illinois, and who shall hold his office for the term of four years and until his successor is appointed and qualified, and who shall receive a salary of thirty hundred dollars per annum and his necessary expenses incurred by him in the discharge of his official duties, and who shall be charged with the enforcement of all laws that now exist or that hereafter may be enacted in this State regarding the production, manufacture, sale and labeling of food herein defined, and to prosecute or cause to be prosecuted any person, firm or corporation, or agent thereof, engaged in the manufacture or sale of any article manufactured or sold in violation of the provisions of any such law or laws. The Governor shall also appoint from time to time, as required, a Food Stanard Commission, for the purpose of determining and adopting standards of quality, purity or strength, for food products, for the State of Illinois, to consist of three members, one of whom shall be the State Food Commissioner or his representative, who shall serve without extra pay; one of whom shall be a representative of the Illinois Food Manufacturing Industries and one of whom shall be an expert food chemist of known

reputation, all to be citizens of the State of Illinois, who shall receive fifteen dollars ($15.00) per day for a period not exceeding thirty (30) days in one year and necessary expenses incurred during the time employed in the discharge of their duties: *Provided,* that said Food Standard Commission, in determining and adopting a standard of quality, purity or strength, of milk or cream, shall fix such standard as may be determined solely by the examination and test of milk or cream and the can or receptacle in which it is placed.

The said commissioner is hereby authorized to appoint, with the advice and consent of the Governor, one assistant commissioner, who shall be a practical dairyman, whose salary shall be $2,000 per annum and expenses incurred in official duties. One chief chemist, who shall be known as State Analyst, whose salary shall be $2,500 and expenses incurred in the discharge of official duties. One attorney whose salary shall be $1,800 per annum and expenses incurred in the discharge of official duties. One chief clerk, whose salary shall be $1,800 per annum and expenses in discharge of official duties. Said commissioner shall also have authority to appoint five analytical chemists, whose salary shall be $1,200 per annum each; twelve inspectors, whose salary shall be $1,200 per annum and the necessary expenses incurred in the performance of their duties. Three (3) stenographers at $900 and one assistant clerk at $900 each.

The said commissioner shall make annual reports to the Governor not later than the 15th of January, of his work and proceedings, and shall report in detail the number of inspectors he has appointed and employed, with their expenses and disbursements and the amount of salary paid the same, and he may from time to time issue bulletins of information, when in his judgment the interests of the State would be promoted thereby.

The said commissioner shall maintain an office and laboratory, where the business of said department may be conducted. This section shall not affect the term of office of the present commissioner, and he shall be regarded as having been appointed under the provisions of this Act.

Sec. 2. *Power of Commissioner and Inspectors Making Inspection.*) The State Food Commissioner, and such inspectors and agents as shall be duly authorized for the purpose, when and as often as they may deem it necessary for the purpose of deter-

mining whether any manufactured food complies with the law, shall examine the raw materials used in the manufacture of food products and determine whether any filthy, decomposed or putrid substance is used in their preparation. They may also examine all premises, carriages or carts where food is manufactured, transported, stored or served to patrons, for the purpose only of ascertaining their sanitary condition and examining and taking samples of the raw materials and finished products found therein; but nothing in this act shall be construed as permitting such officers to inquire into, or examine methods of processes of manufacture, or requiring or compelling proprietors or manufacturers, or packers of proprietary or other food products, to disclose trade rights or secret processes, or methods of manufacture. Said commissioner, inspectors and agents shall have power and authority to open any package, can or vessel, containing or supposed to contain, any article manufactured, sold or exposed for sale, or held in possession with intent to sell, in violation of the provisions of this Act, or laws that now exist, or that may hereafter be enacted in this State, and may inspect the contents thereof, and may take samples therefrom for analysis. The employes of railroads, express companies or common carriers shall render to them all the assistance in their power, when so requested, in tracing, finding or disclosing the presence of any article prohibited by law, and in securing samples thereof as hereinafter provided for.

Sec. 3. *Refusal to Assist Inspector a Misdemeanor.*) Any refusal or neglect on the part of such employes of railroads, express companies or other common carriers, to render such friendly aid, or to furnish such samples for analysis, as provided for in section 2 of this Act, shall be deemed a misdemeanor, and shall be punished as hereinafter provided.

Sec. 4. The person taking such sample as provided for in section 2 of this Act, shall in the case of bulk or broken package goods divide the same into two equal parts, as nearly as may be, and in the case of sealed and unbroken packages he shall select two of said packages, which two said packages shall constitute the sample taken and, properly to identify the same, he shall, in the presence of the person from whom the same is taken, mark or seal each half or part of such sample with a paper seal or otherwise, and shall write his name thereon and number each part of

said sample with the same number, and also write thereon the name of the said dealer in whose place of business the sample is found, and the person from whom said sample is taken shall also write his own name thereon, and at the same time the person taking said sample shall give notice to such person from whom said sample is taken that said sample was obtained for the purpose of examination by the State Food Commissioner. One part of said sample shall be taken by the person so procuring the same to the State Analyst or other competent person appointed for the purpose of making examinations or analyses of samples so taken, and the person taking such sample shall tender to the person from whom it is taken the value of that part thereof so retained by the person taking said sample; the other part of said sample shall be delivered to the person from whom said sample is taken. If the person from whom said sample is taken has recourse upon the manufacturer or guarantor, either by operation of law or under contract for any failure of the part of said sample to comply with the provisions of this Act, then said person from whom said sample is taken shall retain for the period of ninety days that part of said sample so delivered to him in order that said manufacturer or guarantor may have the same examined or analyzed if he so desires.

Provided, that the person procuring said sample may securely pack and box that part thereof retained by him and send the same to the State Analyst, or other competent person appointed hereunder for the purpose of making examinations or analyses of samples, and his testimony that he did procure the sample and that he sealed and numbered the same as herein provided, and that he wrote his name thereon and that he packed and boxed said part thereof and sent the same to the State Analyst, or other competent person appointed hereunder to analyze such sample, and the testimony of the person to whom said package or box is addressed that he received the same in apparent good order, that said sample was sealed, and that the number thereof and name of the sender, as herein provided for, was on said sample, and that the seal at the time the same was received was unbroken, shall be *prima facie* evidence that the sample so received is the sample that was sent, and that the contents thereof are the same and in the same condition as at the time the person so procuring said sample parted with the possession thereof, and the

testimony of said two witnesses as above shall be sufficient to make such *prima facie* proof.

Sec. 5. *Manufacturing Adulterated or Misbranded Food Misdemeanor.*) It shall be unlawful for any person to manufacture for sale within the State of Illinois any article of food or drink which is adulterated or misbranded within the meaning of this Act, and any person who shall violate any of the provisions of this section shall be guilty of misdemeanor and on conviction thereof shall be punished according to the provisions of this Act.

Provided, that no article of food shall be deemed misbranded or adulterated within the provisions of this Act when intended for export to any foreign country or purchaser, and prepared or packed according to the specifications or directions of the foreign country to which said article is intended to be shipped; but is said article shall be in fact sold or offered for sale for domestic use or consumption, then this proviso shall not except said article from the operation of any of the other provisions of this Act.

Sec. 6. *Possession Misbranded or Adulterated Articles Provided.*) The having in possession of any article of food or drink which is misbranded or adulterated with intent to sell the same, is hereby prohibited; and whoever shall have in his possession with the intent to sell, sell or offer for sale any article which is adulterated or misbranded within the meaning of this Act, shall be guilty of a misdemeanor, and on conviction thereof shall be punished as hereinafter provided. Proof that any person, firm or corporation has or had possession of any article which is adulterated or misbranded shall be *prima facie* evidence that the possession thereof is in violation of this section.

Sec. 7. *Term Food Defined.*) The term "food," as used herein, shall include all articles used for food, drink, confectionery or condiment by man or other animals, whether simple, mixed or compound, and any substance used as a constituent in the manufacture thereof.

Sec. 8. *Defines Adulteration.* That for the purpose of this Act an article shall be deemed to be adulterated—

In case of confectionery:

First—If it contains terra alba, barytes, talc, chrome yel-

low, paraffin, mineral fillers or poisonous substances, or poisonous color or flavor.

Second—If it contains any ingredient deleterious or detrimental to health, or any vinous, malt or spiritous liquor or compound, or narcotic drug.

In case of food:

First—If any substance has been mixed or packed with it so as to reduce or lower or injuriously affect its quality, strength or purity.

Second—If any substance has been substituted wholly or in part for the article.

Third—If any valuable constituent of the article has been wholly or in part abstracted: *Provided,* that in the manufacture of skim or separated cheese the whole or part of the butter fats in the milk may be abstracted.

Fourth—If it be mixed, colored, powdered, coated, polished or stained in any manner whereby damage or inferiority is concealed, or it is made to appear better or of greater value than it really is.

Fifth—If it contains any added poisonous or other added deleterious ingredient which may render such article injurious to health: *Provided,* that when in the preparation of food products for shipment they are preserved by an external application, applied in such a manner that the preservative is necessarily removed mechanically, or by maceration in water, or otherwise, and directions for the removal of said preservatives shall be printed on the covering of the package, the provisions of this Act shall be construed as applying only when such products are ready for consumption; and formaldehyde, hydrofluoric acid, boric acid, salicylic acid and all compounds and derivatives thereof are hereby declared unwholesome and injurious.

Sixth—If it consists in whole or in part of a filthy, decomposed or putrid, infected, tainted or rotten animal or vegetable substance or article, or any portion of an animal unfit for food, whether manufactured or not, or if it is the product of a diseased animal, or one that has died otherwise than by slaughter.

Sec. 9. *Misbranded Defined.* The term "misbranded," as used herein, shall apply to all articles of food or drink, or articles which enter into the composition of food or drink, the packages or label of which shall bear any statement, design or device regarding such article, or the ingredients or substance

contained therein which shall be false or misleading in any particular; and to any such products which are falsely branded as to manufacturer, packer or dealer who sells the same, or as to the state, territory or country in which it is manufactured or produced. That for the purpose of this Act an article shall be deemed misbranded—

In case of food:

First—If it be an imitation of or offered for sale under the distinctive name of another article.

Second—If it be labeled or branded so as to deceive or mislead the purchaser, or purports to be a foreign product when not so, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed in such package, or if it shall fail to bear a statement on the label of the quantity or proportion of any morphine, opium, cocaine, heroin, alpha or beta eucaine, chloroform, cannabis indica, chloral hydrate or acetanilid, or any derivative or preparation of any such substances contained therein.

Third—If in any package form and the contents are stated in terms of weight or measure, they are not correctly and plainly stated on the outside of the package.

Fourth—If it be a manufactured article of food or food sold in package form, and is not distinctly labeled, marked or branded with the true name of the article, and with either the name of the manufacturer and place of manufacture or the name and address of the packer or dealer who sells the same.

Fifth—If the package containing it or its label shall bear any statement, design or device regarding the ingredients of the substance contained therein, which statement, design or device shall be false or misleading in any particular: *Provided,* that an article of food which does not contain any added poisonous or deleterious ingredients shall not be deemed to be adulterated or misbranded in following cases:

First—In case of mixtures or compounds which may be now, or from time to time hereafter known as articles of food under their own distinctive names, and not an imitation of or offered for sale under the distinctive name of another article, if the name be accompanied on the same label or brand with a statement of the place where the article has been manufactured or produced.

Second—In case of articles labeled, branded or tagged so as to plainly indicate that they are compounds, imitations or blends, and the word "compound," "imitation" or "blend," as the case may be, is plainly stated on the package in which it is offered for sale: *Provided,* that the term "blend," as used herein, shall be construed to mean a mixture of like substances, not excluding harmless coloring or flavoring ingredients used for the purpose of coloring and flavoring only; and as applied to alcoholic beverages, only those distilled spirits shall be regarded as "like substances" which are distilled from the fermented mash of grain and are of the same alcoholic strength: *And, provided, further,* that nothing in this Act shall be construed as requiring or compelling proprietors or manufacturers of proprietary foods, which contain no unwholesome added ingredients, to disclose their trade formulas, except in so far as the provisions of this Act may require to secure freedom from adulteration or misbranding.

Third—In the case of mixtures of corn syrup (glucose) or corn sugar (dextrose) or corn sugar syrup, with cane or beet sugar (sucrose) or cane or beet sugar syrup, in food, if the maximum percentage of corn syrup (glucose), or corn sugar (dextrose) or corn sugar syrup, in such article of food be plainly stated on the label.

Sec. 10. *Confiscation and Condemnation of Misbranded or Adulterated Foods.* Any article of food or drink or liquor that is adulterated or misbranded within the meaning of this Act, and is being sold or offered for sale within the State of Illinois, shall be liable to be proceeded against in any circuit court, or the Superior Court of Cook county, or the municipal court of any city, or before any justice of the peace within whose jurisdiction the same may be found, and seized for confiscation by process of law or condemnation. And if such article is condemned as being adulterated or misbranded, or of a poisonous or deleterious character within the meaning of this Act, the same shall be disposed of by destruction or sale, as the said court may direct, and the proceeds thereof, if sold, less the legal costs and charges, shall be paid into the treasury of the State of Illinois and credited to the fund of the State Food Commission, to be used in the enforcement of the State food laws, but such goods shall in no instance be sold contrary to the provisions of this Act: *Provided, however,* that upon the payment of the costs of such libel pro-

ceedings and the execution and the delivery of a good and sufficient bond to the effect that such articles shall not be sold or otherwise disposed of contrary to the provisions of this Act, the court may, by order, direct that such articles be delivered to the owner thereof. Either party may demand trial by jury upon any issue of fact joined in any such case, and all such proceedings shall be at the suit of and in the name of the People of the State of Illinois.

Sec. 11. *Vinegar to Be Branded.*) All vinegar made by fermentation and oxidation without the intervention of distillation, shall be branded with the name of the fruit or substance from which the same is made. All vinegar made wholly or in part from distilled liquor shall be branded "distilled vinegar," and shall not be colored in imitation of cider vinegar. All vinegar shall be made wholly from the fruit or grain from which it purports to be or is represented to be made, shall contain no foreign substance, and shall contain not less than four per cent, by weight, of absolute acetic acid.

Sec. 12. *Extracts to Be Labeled.*) Extracts made of more than one principle shall be labeled in a conspicuous manner with the name of each principle, or else with the name of the inferior or adulterant; and in all cases when an extract is labeled with two or more names, such names must be in a conspicuous place on said label, and in no instance shall such mixture be called imitation, artificial or compound, and the name of one of the articles used shall not be given greater prominence than another: *Provided,* that all extracts which cannot be made from the fruit, berry, bean or other part of the plant, and must necessarily be made artificially, as raspberry, strawberry, etc., shall be labeled "imitation," in letters similar in size and immediately preceding the name of the article: *Provided, further,* that prepared cocoanut, containing nothing other than cocoanut sugar and glycerine, shall be labeled as prepared cocoanut, and when so made need not be labeled "compound" or "mixture."

Sec. 13. *Baking Powder—How Labeled.*) No person by himself, his servant or his agent, or as the servant of any other person, shall, *first,* make or manufacture baking powder or any other mixture or compound intended for use as baking powder; *second,* or sell, exchange, deliver or offer for sale or exchange such baking powder or any mixture or compound intended for

use as baking powder, unless the same shall contain not less than ten per cent available carbon dioxide and unless the common names of all the ingredients be printed on the label.

Sec. 14. *Adulterated Spirituous, Malt or Vinous Liquors Prohibited.*) No person shall, within this State, by himself, his servant or agent, or as a servant or agent of any other person or corporation, manufacture, brew, distill, have or offer for sale, or sell any spirituous or fermented or malt liquor, containing any drug, substance or ingredient not healthful or not normally existing in said spirituous, fermented or malt liquor, or which may be deleterious or detrimental to health when such liquors are used as a beverage, and the following drugs, substances or ingredients shall be deemed to be not healthful and shall be deemed to be deleterious or detrimental to health when contained in such liquors, to-wit: Cocculus indicus, copperas, opium, cayenne pepper, picric acid, Indian hemp, strychnine, arsenic, tobacco, darnel seed, extract of logwood, salts of zinc, copper or lead, alum, methyl, alcohal and its derivatives and any extracts or compound of any of the above drugs, substances or ingredients, and any person violating any of the provisions of this section shall be deemed guilty of a misdemeanor.

Sec. 15. *Mutilating Label Prohibited.*) Whoever shall deface, change, erase or remove any mark, label or brand provided for this Act with intent to mislead, deceive or to violate any of the provisions of this Act, shall be held liable to the penalties of this Act.

Sec. 16. *Sale of Unclean or Unwholesome Milk for Consumption and Unsanitary Containers Prohibited.*) No person, firm or corporation shall offer for sale, or sell to any person, firm or corporation, creamery or cheese factory, any unclean, unhealthful, unwholesome or adulterated milk or cream, or any nmilk or cream which has not been well cooled or to which water or any foreign substance has been added or milk or cream which has been handled or transported in unclean or unsanitary vessels or containers: *Provided,* that nothing in this section shall be construed to prevent the sale of skim milk to factories engaged in the manufacture of skim milk products, nor the sale of skim milk under the provisions of section 19 of this Act.

Sec. 17. *Persons Receiving Milk to Wash Canns.*) Any person, firm or corporation who receives from any other person,

firm or corporation, any milk or cream in cans, bottles or vessels which have been transported over any railroad or boat line, where such cans, bottles or vessels are to be returned, shall cause the said cans, bottles or vessels to be emptied before the said milk or cream cantained therein shall become sour, and shall cause said cans, bottles or vessels to be immediately washed and thoroughly cleansed and aired.

Sec. 18. *Not to Manufacture Food from Impure or Unclean Milk or Cream.*) No person, firm or corporation shall manufacture from unclean, impure, unhealthful or unwholesome milk, or from cream from the same, any article of food.

Sec. 19. *Sale of Skim Milk—Cans—How Labeled.*) No person, firm or corporation shall sell, or expose for sale, or have in his possession with intent to sell, in any store or place of business, or on any wagon or other vehicle, used in transporting milk or milk commonly called "skim milk" without first attaching to the can, vessel or other package containing said milk, a tag with the words "skim milk" printed on both sides of said tag in large letters, each letter being at least three-fourths of an inch high and one-half inch wide. Said tag shall be attached to the top or side of said can, vessel or package where it can be easily seen.

Sec. 20. *Instruments for Measuring Milk and Cream Standards.*) The State standard milk measure or pipettes shall have for milk a capacity of seventeen and six-tenths cubic centimeters, and the State standard test tube or bottles for milk shall have a capacity of two cubic centimeters of mercury at a temperature of sixty degrees Fahrenheit between "zero" and ten on the graduated scale marked on the necks thereof. For cream eighteen grams shall be used, and the standard test tubes or bottles for cream shall have a capacity of six cubic centimeters of mercury at a temperature of sixty degrees Fahrenheit between "zero" and thirty on the graduated scale marked on the necks thereof, and it is hereby made a misdemeanor to use any other measure, pipette, test tube or bottle to determine the per cent of butter fat where milk or cream is purchased by, or furnished to creameries or cheese factories, and where the value of said milk is determined by the per cent of butter fat contained in the same. Any manufacturer, merchant, dealer, or agent in this State who shall offer for sale or sell cream or milk pipette

or measure, test tube or bottle which is not correctly marked or graduated, as herein provided, shall be guilty of a misdemeanor and upon conviction thereof shall be punished as provided in this Act.

Sec. 21. *Underreading Babcock Test Prohibited.*) It shall be unlawful for the owner, manager, agent or any employe of a creamery or cheese factory to manipulate or underread the Babcock test, or any other contrivance used for determining the quality or value of milk, or to falsify the record thereof, or to pay for such milk on the basis of any measurement except the true measurement, as thereby determined.

Sec. 22. *Sale of Preservatives Prohibited.*) No person, firm or corporation shall manufacture for sale, advertise, offer or expose for sale, or sell, any mixture or compound intended for use as a preservative or other adulterant of milk, cream, butter or cheese, nor shall he manufacture for sale, advertise, offer or expose for sale, or sell, any unwholesome or injurious preservative of any food: *Provided, however,* that this section shall not apply to pure salt added to butter and cheese.

Sec. 23. *Vehicles to Be Marked.*) Any person, firm or corporation, who shall in any of the cities, incorporated towns or villages of this State which contains a population of 5,000 or over, engage in or carry on a retail business in the sale or exchange of, or any retail traffic in milk or cream, shall have each and every carriage or vehicle from which the same is vended, conspicuously marked with the name of such vendor on both sides of such carriage or vehicle.

Sec. 24. *Illegal Lard.*) ..No Person shall, within this State, manufacture for sale, have in his possession with intent to sell, offer or expose for sale, or sell, as lard, any substance not the legitimate and exclusive product of the fat of the hog.

Sec. 25. *Lard Substitute.*) No person shall manufacture for sale within this State, or have in his possession with intent to sell, offer or expose for sale, or sell, as lard, or as a substitute for lard, or as an imitation of lard, any mixture or compound which is designed to take the place of larn and which is made from animal or vegetable oils or fats other than the fat of the hog, or any mixture or combination with any animal or vegetable oils or fats, unless the tierce, barrel, tub, pail or package containing the same shall be distinctly and legibly branded or

labeled with the name of the person, firm or corporation making the same, together with the location of the manufactory and the words "lard substitute" or "adulterated lard" or "compound," "imitation" or "blend," as the case may be, or unless the same shall be sold under its own distinctive name, as provided for in section 9 of this Act.

Sec. 26. *Persons Selling Imitation or Substitute for Lard to Inform Purchaser.*) It shall be unlawful to sell or offer for sale any "lard substitute" or "adulterated lard" or "compound," "imitation" or "blend," as herein defined, without informing the purchaser thereof, or the person or persons to whom the same is offered for sale, that the substitute sold or offered for sale is "lard substitute" or "adulterated lard" or "compound," "imitation" or "blend," as the case may be.

Sec. 27. *Sale of Process Butter not Branded Prohibited.*) No person, firm or corporation, agent or employe, shall manufacture for sale, sell, offer or expose for sale, in this State, any butter that is produced by taking original packing stock butter, or other butter, or both, and melting same so that the butter fat can be drawn off or extracted, then mixing the said butter fat with skimmed milk, or milk, or cream, or other milk product, and rechurning or reworking the said mixture, or that produced by any process that is commonly known as boiled, process or renovated butter, unless the same is branded or marked, as provided in section 28 of this Act.

Sec. 28. *Process Butter—How Branded.*) No person, firm, corporation, agent or employe, shall sell, offer or expose for sale, or deliver to a purchaser, any boiled, process or renovated butter, as defined in section 27 of this Act, unless the words "Renovated Butter" shall be plainly branded with gothic or bold face letters at least three-fourths of an inch in length on the top and sides of each tub, or box, or pail, or other kind of case or package, or on the wrapper of prints or rolls or bulk packages in which it is put up. If such butter is exposed for sale uncovered, or not in a case or package, a placard containing the label so printed shall be attached to the mass of butter in such a manner as to be easily seen and read by the purchaser. The branding or marking of all packages shall be in the English language, and in a conspicuous place so as to be easily seen and read by the purchaser.

Sec. 29. *Illegal Foods to be Seized.*) Whenever the commissioner or his agents shall have ground for suspicion that any article of food, found in possession of any person, firm or corporation, is adulterated or misbranded within the meaning of this Act, he may seize such article of food and make an inventory thereof, and shall leave a copy of such inventory with the party holding such suspected goods, and tag the same "suspected"; and he shall notify in writing the person, firm or corporation in whose possession it may be found, not to offer the same for sale or sell or otherwise dispose of the same until further notice in writing from the commissioner. Whereupon the commissioner shall forthwith cause a sample of said article of food to be examined or analyzed, and if the same shall be found to be adulterated or misbranded within the meaning of this Act, the commissioner shall proceed with a hearing and subsequent proceedings as provided in this Act. If, however, such examination or analysis shall show that such article of food complies with the provisions of this Act, the person, firm or corporation in whose possession such article of food is found shall forthwith be notified in writing that such seizure is released, and authority given to dispose of such article of food. Such seizure may be had without a warrant and said commissioner, and all inspectors and agents appointed pursuant to law, are hereby given full power and authority of "policemen." Any court having jurisdiction, upon receiving proof of probable cause for believing in the concealment of dairy food or dairy products or substitutes therefor, or imitation thereof, kept for sale or for a purpose, or had in possession or under control, contrary to the provisions of this Act, or other laws which now exist or may be hereafter enacted, shall issue a search warrant and cause a search to be made in any place therefor and to that end may cause any building, enclosure, wagon or car to be entered, and any apartment, chest, box, locker, tub, jar, crate, basket or package to be broken open and the contents thereof examined.

Sec. 30. *Search Warrants to be Issued for Illegal Food.*) All warrants issued pursuant to section 29 hereof shall be directed to the sheriff, bailiff or some constable of the country where such food or dairy products may be supposed to be concealed, commanding such officer to search the house or place where such food or dairy product, or substitute thereof, or imitation thereof,

for which he is required to search, is believed to be concealed, which place and the property to be searched for, shall be designated in the warrant, and to bring such food or dairy product or substitute therefor or imitation thereof, when found, and the person in whose possession the same is found, before the magistrate who issued the warrant, or before some other court or magistrate having jurisdiction of the case to be proceeded against as hereinbefore provided for in section 10 of this Act.

Sec. 31. State's Attorney to Assist.) It shall be the duty of the State's Attorney in any county of this State when called upon by the commissioner, or any of his assistants to render any legal assistance in his power to execute the law and to prosecute cases arising under the provisions of this Act: *Provided,* That no person shall be prosecuted under the provisions of this Act for selling or offering for sale any article of food or drugs as defined herein, when same is found to be adulterated or misbranded within the meaning of this Act, in the original unbroken package in which it was received by said person when he can establish a guaranty signed by the wholesaler, jobber, manufacturer or other party residing in this State, from whom he purchased such article, to the effect that the same is not adulterated or misbranded in the original unbroken package in which said article was received by said dealer, within the meaning of this Act, designating it. Said guaranty to afford protection, shall contain the name and address of the party or parties making the sale of such article to such dealer, and in such case said party or parties shall be amenable to the prosecutions, fines and other penalties as provided for in this Act: *Provided,* That no such guaranty shall operate as a defense to prosecutions for the violation of this Act. *First.* If the dealer shall continue to sell after notice by the State Food Commissioner that such article is adulterated or misbranded within the meaning of this Act. *Second.* If the dealer shall fail to preserve for the manufacturer or guarantor and deliver to him upon demand the sample left with him by the commissioner or his agent.

Sec. 32. *State Board of Health to Furnish Samples.*) The State Board of Health may submit to the commissioner or any of his assistants samples of food or drink for examination or analysis, and shall receive special reports showing the results of such examination or analysis.

Sec. 33. *State Analysis Shall not Furnish Certificate of*

assistant State Analyst to furnish to any individual, firm or corporation any certificate as to the purity or excellence of any article manufactured or sold by them to be used as food or in the preparation of food.

Sec. 34. *Using Shift or Device.*) The use of any shift or device to evade any of the provisions of this Act shall be deemed a violation of such provision and punishable as herein provided.

Sec. 35. *Master's Liability, Etc.*) Whoever shall, by himself or another, either as principal, clerk or servant, directly or indirectly, violate any of the provisions of this Act, shall be guilty of a misdemeanor and punished as herein provided.

Sec. 36. *Penalties, License Fees and Proceeds Paid to State Treasurer.*) All fines, penalties, and all proceeds collected from goods confiscated and sold under the provisions of this Act and other laws relating to dairy and food products, and all license fees collected hereunder, shall be paid into the State Treasury.

Sec. 37. *Label—Size of Type.*) The principal label on any package of food, as defined by this Act, shall be printed plainly and legibly in English with or without the foreign label in the language of the country where the product is produced or manufactured and the size of type, if not otherwise described in this Act, shall not be smaller than EIGHT-POINT (BREVIER) CAPS: *Provided,* That in case the size of the package will not permit the use of eight-point cap type, the size of the type may be reduced proportionately.

Sec. 38. *Food Commissioner to Make Rules and Regulations.*) The State Food Commissioner shall make rules and regulations for carrying out the provisions of this Act, and shall have power to make rules and regulations for analyzing and reporting the results thereof, of articles submitted for analysis by the State Board of Health, and regulating the analyzing and reporting thereon of samples taken under any law or laws of the United States by any person hereunder, or furnished by any officer or employe charged with the enforcement of the laws of the United States relative to the manufacture, sale or transportation of adulterated, misbranded, poisonous or deleterious foods, dairy products or articles manufactured from dairy products or liquors.

Sec. 39. *Standard of Purity and Strength.*) In the enforcement of this Act, and in the construction thereof, the following named articles of food stuffs, when offered for sale or exposed for sale, or sold, shall conform to the analytical requirements set opposite each respectively.

Milk shall contain not less than three (3) per cent of milk fat and not less than eight and one-half (8.5) per cent of solids, not fat.

Condensed Milk and Evaporated Milk shall contain not less than twenty-eight (28) per cent of milk solids and one hundred (100) per cent of such milk solids shall contain not less than twenty-seven and five-tenths (27.5) per cent of milk fat.

Cream shall contain not less than eighteen (18) per cent of milk fat.

Maple Sugar shall contain not less than sixty-five one hundredths (0.65) per cent of maple ash in the water-free substance.

Honey is laevo-rotatory, containing not more than twenty-five (25) per cent of water, not more than twenty-five hundredths (0.25) per cent of ash and not more than eight (8) per cent of sucrose.

Cloves shall contain not more than five (5) per cent of clove stems, not less than ten (10) per cent of volatile ether extract, not less than twelve (12) per cent of quercitannic acid, not more than eight (8) per cent of total ash, not more than five-tenths (0.5) per cent of ash insoluble in hydrochloric acid, and not more than ten (10) per cent of crude fiber.

Black Pepper shall contain not less than six (6) per cent of non-volatile ether extract, not less than twenty-five (25) per cent of pepper starch, not more than seven (7) per cent of total ash, not more than (2) per cent of ash insoluble in hydrochloric acid, and not more than fifteen (15) per cent of crude fiber.

Lemon Extract shall contain not less than five (5) per cent of oil of lemon by volume.

Orange Extract shall contain not less than five (5) per cent of oil of orange by volume.

Vanilla Extract shall contain in one hundred (100) cubic centimeters the soluble matters from not less than ten (10) grams of vanilla bean.

Olive Oil has a refractive index (25 degrees C.) not less than one and forty-six hundred and sixty ten thousandths (1.4660) and not exceeding one and forty-six hundred and eighty ten-thousandths (1.4680); and an iodin number not less than seventy-nine (79) and not exceeding ninety (90).

All Vinegars shall contain four (4) grams of acetic acid in one hundred (100) cubic centimeters (20 degrees C.)

Cider Vinegar shall contain not less than one and six-tenths (1.6) grams of apple solids, and not less than twenty-five hundredths (0.25) grams of apple ash in one hundred (100) cubic centimeters (20 degrees C.)

Wine Vinegar shall contain not less than one (1) gram of grape solids and not less than thirteen-hundredths (0.13) gram of grape ash in one hundred cubic centimeters (20 degrees C.)

Malt Vinegar shall contain in one hundred (100) cubic centimeters (20 degrees C.) not less than two (2) grams of solids and not less than two-tenths (0.2) gram of ash.

In the enforcement of this Act and the construction thereof all articles of food not defined in this Act, when offered for sale or exposed for sale, or sold, shall conform to the definition and analytical requirements of the standard adopted and promulgated from time to time by the State Food Standard Commission: *Provided,* such standards for any article of food or drink, or for any substance used or intended to be used in food or drink shall be deemed *prima facie* evidence of the proper standard of quality,, purity and strength of any such article or substance, but shall only be deemed such *prima facie* evidence in the trial of cases brought in the proper courts to enforce the provisions of this Act.

Provided, That nothing in this section shall be construed to prevent the sale of any wholesome food product which varies from such standards, if such article of food be labeled so as to clearly indicate such variation.

Sec. 40. *Preliminary Hearing by the Commissioner.*) When it appears from the examination or analysis that the provisions of this Act have been violated, the Food Commissioner shall cause notice of such fact, together with a copy of the findings, to be given to the party or parties from whom the sample was obtained; and to the party, if any, whose name appears upon the label as manufacturer, packer, wholesaler, retailer, or other dealer, by registered mail. The receipt of the post office depart-

ment for such registered notice shall be received as *prima facie* evidence that such notice has been given. The party, or parties, so notified, shall be given an opportunity to be heard under such rules and regulations as may be prescribed as aforesaid. Notices shall specify the date, hour and place of the hearing. The hearing shall be private, and the parties interested therein may appear in person or by attorney. If, after such hearing, the commissioner shall believe this Act has been violated, he shall cause the party, or parties, whom he believes to be guilty, to be prosecuted forthwith, under the provisions of this Act. No action or prosecution shall be instituted against any person for a violation of the provisions of this Act, unless the same shall have been commenced within ninety days from the taking of said sample.

Sec. 41. *Penalty.*) Any person convicted of violating any of the provisions of the foregoing Act shall, for the first offense, be punished by a fine in any sum not less than fifteen ($15) dollars, and not more than one hundred (100) dollars, or by imprisonment in the county jail not exceeding thirty days, or by both such fine and imprisonment, in the discretion of the Court, and for the second and each subsequent offense by a fine of not less than twenty-five (25) dollars and not more than two hundred (200) dollars, or by imprisonment in the county jail not exceeding one year, or both, in the discretion of the Court; or the fine above may be sued for and recovered before any justice of the peace or any other court of competent jurisdiction in the county where the offense shall have been committed, at the instance of the State Food Commissioner or any other person in the name of the People of the State of Illinois as plaintiff and shall be recovered in an action of debt.

Sec. 42. *Judgment—Issuing Capias.*) When the rendition of the judgment imposes a fine as provided in any of the sections of this Act, it shall be the duty of the Justice of the Peace or other court rendering such judgment also to render a judgment for costs and such Justice of the Peace or other court shall forthwith issue a capias or warrant of commitment against the body of the defendant, commanding that unless the said fine and costs be forthwith paid the defendant shall be committed to the jail of the county and the constable or other officer, to whose hands said capias or warrant shall come, shall in default of such payment, arrest the defendant and commit him to the jail of the county,

there to remain as provided in Section 171 of "An Act to revise the law in relation to criminal jurisprudence," in force July 1, 1885 unless such fine and costs shall sooner be paid.

Sec. 43. *Repeal.*) All Acts and parts of Acts inconsistent with this Act are hereby repealed: *Provided,* That nothing in this Act contained shall be construed as repealing the act entitled "An Act to regulate the manufacture and sale of substitutes for butter," approved June 14, 1897, in force July 1, 1897, or any part thereof.

Approved May 14, 1907.

In force July 1, 1907.

FOOD AND DAIRY LAW.

An Act to regulate the manufacture and sale of substitutes for butter.

Section 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly*: That for the purpose of this Act, every article, substitute or compound or any other than (that) which is produced from pure milk or cream therefrom,made in the semblance of butter and designed to be used as a substitute for butter made from pure milk or its cream, is hereby declared to be imitation butter: *Provided,* that the use of salt and harmless coloring matter for coloring the product of pure milk or cream sshall not be construed to render such product an imitation.

Sec. 2. No person shall coat, powder or color with annato or any coloring matter whatever, any substance designed as a substitute for butter, whereby such substitute or product so colored or compounded shall be made to resemble butter, the product of the dairy.

No person shall combine any animal fat or vegetable oil or other substance with butter, or combine therewith, or with animal fat or vegetable oil, or combination of the two, or with either one, any other substance or substances, for the purpose or with the effect of imparting thereto a yellow color or any shade of yellow so that such substitute shall resemble yellow or any shade of genuine yellow butter, nor introduce any such coloring matter or such substance or substances into any of the articles of which the same is composed.

Provided, Nothing in this Act shall be construed to prohibit the use of salt, rennet and harmless coloring matter for coloring the product of pure milk or cream from the same.

No person shall, by himself, his agents, or employes produce or manufacture any substance in imitation or semblance of natural butter, nor sell, nor keep for sale, nor offer for sale, any imitation butter, made or manufactured, compounded or produced in violation of this section, whether such imitation butter shall be made or produced in this State or elsewhere.

This section shall not be construed to prohibit the manufacture and sale, under the regulations hereinafter provided, of substances designed to be used as a substitute for butter and not manufactured or colored as herein provided.

Sec. 3. Every person who lawfully manufactures any substance designed to be used as a substitute for butter, shall mark by branding, stamping or stenciling upon the top or side of each box, tub, firkin or other package in which such article shall be kept, and in which it shall be removed from the place where it is produced, in clear and durable manner in the English language, the word "oleomargarine," or the word "butterine," or the words "substitute for butter," or the words "imitation butter," in printed letters in plain Roman type, each of which shall not be less than three-quarters of an inch in length.

Sec. 4. It shall be unlawful to sell or offer for sale any imitation butter without informing the purchaser thereof, or the person or persons to whom the same is offered for sale, that the substance sold or offered for sale is imitation butter.

Sec. 5. No person, by himself or others, shall ship, consign or forward by any common carrier, whether public or private, any substance designed to be used as a substitute for butter unless it shall be marked or branded on each tub, box, firkin, jar or other package containing the same, as provided in this Act, and unless it be consigned by the carriers and receipted for by its true name: *Provided,* that this Act shall not apply to any goods in transit between foreign states across the State of Illinois.

Sec. 6. No person shall have in his possession or under his control any substance designed to be used as a substitute for butter, unless the tub, firkin, jar, box or other package containing the same be clearly and durably marked as provided in

this Act: *Provided,* that this section shall not be deemed to apply to persons who have the same in their possession for the actual consumption of themselves (or) their families. Every person who shall have possession or control of any imitation butter for the purpose of selling the same which is not marked as required by the provisions of this Act, shall be presumed to have known during the time of such possession or control the true character and name, as fixed by this Act, of such product.

Sec. 7. Whoever shall have possession or control of any imitation butter or any substance designed to be used as a substitute for butter, contrary to the provisions of this Act, for the purpose of selling the same, or offering the same for sale, shall be held to have possession of such property with intent to use it in violation of this Act.

Sec. 8. No action shall be maintained on account of any sale or contract made in violation of, or with intent to violate, this Act by or through any person, who was knowingly a party to such wrongful sale or contract.

Sec. 9. Whoever shall deface, erase or remove any mark provided by this Act, with intent to mislead, deceive, or to violate any of the provisions of this Act, shall be guilty of a misdemeanor.

Sec. 10. Whoever shall violate any of the provisions of this Act shall be punished by a fine of not less than $50 nor more than $200, or by imprisonment in the county jail not to exceed 60 days for each offense, or by both fine and imprisonment, in the discretion of the court, or the fine alone may be sued for and recovered before any Justice of the Peace in the county where the offense shall be committed, at the instance of any person in the name of the People of the State of Illinois as plaintiff.

Sec. 11. It is hereby made the duty of the State's Attorney of each county in this State to prosecute all violations of this Act upon complaint of any person, and there shall be taxed as his fees in the case the sum of ten dollars ($10), which shall be taxed as costs in the case.

Approved June 14, 1897, in force July 1, 1897.

ALFRED H. JONES, *Commissioner.*

H. E. SCHUKNECHT, *Assistant Commissioner.*

T. J. BRYAN, PH. D., *State Analyst.*

MEMBERSHIP LIST FOR 1908.

A

Alexander, A. B., Effingham.
Alexander, C. B., Chicago (Star Union Line).
Adams, Chas. J., Loda.
Ardrey, R. G., Oakdale.
Austin, F. G., Effingham.
Auten, A. O., Jerseyville.
Aulenburk, Henry, Effingham.
Adams, A. A., Harvard.
Adams, J. G., Marengo.
Allen, J. J., 215 Jackson Blvd., Chicago.
Am. Milk Prod. Co., Union.
Andrews, L. V., Marengo.
Andrews, P. W., Marengo.
Anthony, Grant, Marengo.
Anthony, John, Marengo.
Austin, F. G., Effingham.

B

Baird, F. W., Custer Park.
Baldwin, Geo. H., Mendon.
Baldwin, R. C., Redpath.
Barnhart, Chas. Elwood.
Bartholomew, C. L., Cedarville.
Barton, Fannie, Block road, Joliet.
Baumgartner, F., Joliet.
Becker, W. J., Farina.
Blanke, R. L., St. Louis, Mo., (Blanke & Hauk).
Blood, F. J., Neenah, Wis., (Wells, Richardson & Co.)
Bloomfield, R. A., Mt. Sterling.
Bloyer, Otto, Elkhorn Grove.
Boehmer, H. Barrington.
Brinker, F. H., Winneshiek.
Bristol, G. S., Plainfield, R. R. 6.
Brooks, J. S., Urbana.
Buchanan, G. L., Rob'nson, R. F. D. 5.
Bueler, Anton, Bemes.
Buelter, Henry, Batavia.
Burton, G. F., Mt. Carroll.
Basnier, J. O., Marengo.
Bean, R. M., Marengo.
Beath, A. G., Marengo.
Beldin, J. T., Marengo.
Bemer, Joe, Elgin.
Benton, D. C., Kaneville.
Biddulph, J. R., Teskelwa, R. No. 1.
Bloodgood, Kate, Marengo.
Bloyer, Geo., Harper.
Boies, W. A., Marengo.
Bollman, B., Rockford.
Bremen, C. H., Marengo.
Bremen, W. H., Marengo.
Brickhouse, S. N., Chicago.
Brock, Chas., Marengo.
Brotzman, Jno., Marengo.
Brotzman, M., Marengo.
Browning, H. A., Elgin.
Butler, F. E., Belvidere.

C

Campbell, A. B., Oregon.
Campbell, M. S., Genoa.
Carbaugh, Wm. T., Lanark, R. R. 1.
Carpenter, K. B., Thomson.
Causey, J. S., Mulberry Grove.
Caven, George, Chicago.
Christensen, C. M.
Clegg, J. F., Chicago (Merrill & Eldredge).
Clinger, J. V., Stewardson.
Coldwater, Jno., Elwood.
Collyer, W. D., Chicago.
Cooksley, Alice M., Humeston, Ia.
Cooley, Fred A., Yorktown.
Coolidge, C. P., Winnebago.
Coolidge, J. H., Galesburg.
Crissey, N. O., Avon.
Cutler, F., Lockport.
Caldwell, E. S., Marengo.
Campbell, B. M., Mascoutah.
Carlson, Chas. G., Marengo.
Carmack, Geo., Marengo.
Carlysle, Hall, Peoria.
Carpenter, C. D., Marengo.
Casey, W., Elgin (W. Salt Co.)
Chase, H. A., Harvard.
Chemman, C. G., Freeport.
Church, L. J., Marengo.
Clark, Chas., Marengo.
Claw, A. S., Plainfield.
Cleary, J., Marengo.
Clute, Tom, Woodstock.
Coarson, B. J., Marengo.
Coleman, L. E., Belvidere.
Collier, Jno. S., Marengo.
Coolidge, C., Winnebago.
Collon, C. W., Marengo.
Colton, C. W., Marengo.
Conn, G. W., Woodstock.
Crissy, A. J., Marengo.
Crissy, S. A. & Son, Marengo.
Crosier, E. I., Utica.
Cutler, Geo. A., Belvidere.
Curtiss, I. R., Marengo.
Curtiss, R. M., Marengo.

D

Davenport, Prof. E., Urbana.
Davis, S. E., Elgin.
Dayton, Hutchinson.
DeLano, H. W., Sugar Grove.
DeLaval Separator Co., Chicago.
Dewey, F. E., Capron.
Dickinson, F. J., Woodbine.
Dowling, Robt. J., Ontarioville.
Duell, H. R., Sandwich.
Davis, Chas., Marengo.
Deneen, W. H., Marengo.
De Yarmond, J. F., Marengo.
Dike, G. H., Marengo.
Dougherty, W. T., Marengo.
Dunham, C. A., Marengo.
Dunken, W. H., Marengo.

E

Eaton, R , Elwood.
Ehlers, Jno., Altamont.
Erf, Prof. Oscar, Columbus, Ohio.
Echternach, H. F., Marengo.
Echtermach, W. D., Genoa.
Eichstradt, Herman, Marengo.
Edwards, J. W., Marengo.
Eichstradt, Fred, Marengo.
Engbring, Wm. H., Effingham.
Englebrecht, Wm., Fairhaven.

F

Fellhoelter, Jos., Effingham, R. F. D. 4.
Ford, J. B. & Co., Wyandotte, Mich.
Foster, Thos., Springfield.
Foss, Chas., Cedarville.
Foster, J. C., Sparta.
Francis, F., New Lenox.
Frankenstein, H. C., Effingham.
Fraser, Prof. W. J., Urbana.
Fredricks, Andrew, Elgin (DeLaval Separator Co.)
Frein, H. P., Smithton.
Freund, S. H., Johnsburgh.
Farr, L. M., Elgin.
Fay, P. W., Marengo.
Fillmer, B. A., Port Byron.
Fillmore Bros., Union.
Finch, B., Marengo.
Fraser, Prof. W. J., Urbana.
Fredericks, Andrew, Elgin.
Freung, S. H., McHenry.

G

Gibbon, T. H., Elgin.
Gillespie, A. D., Watson.
Gillett, W. J., Rosendale, Wis.
Glover, A., Ft. Atchison, Wis.
Goeller, J. G., Tower Hill.
Gordon, M. D., Wyandotte, Mich. (J. B. Ford Co.)
Gravenhorst, A., Effingham.
Gravenhorst, J. W., Effingham.
Green, G. M., Mt. Olive.
Green, W. J., Welton.
Green, Wm. M., Lockport.
Greenwood, H., Joliet.
Greenwood, Ivan J., Bristol.
Grossman, J. H., Martinville.
Grout, A. P., Winchester.
Gullickson, Martin, Frankfort Station.
Gurler, G. H., DeKalb.
Gault, R., Marengo.
Gherka, Wm., Marengo.
Gilkerson, Chas. T., Marengo.
Gilkerson, F., Marengo.
Gill, T. H., Marengo.
Gillespie, A. D., Watson.
Greene, S. F., 7670 Union Ave., Chicago.
Griebel, Fred, Marengo.

H

Hadley, E., Joliet.
Haley, C. F., Marley.
Hartman, W. T Naperville.
Hatch, Fred L., Spring Grove.
Hauk, R. B., St. Louis, Mo.
Hayden, C. C., Urbana.
Heath, G. W., Mason, R. F. D. 1.
Henry, R. J., Millersburg.
Herman, Jno., Raymond.
Hicks, J. E., Thompson.
Holland, O. E., Warren.
Horsing, S. S., Stillman Valley.
Hostetter, A. B., Springfield.
Hostetter, W. R., Mt. Carroll.
Hovey, E. L., Capron.
Hunt, Geo. A., Hebron.
Hackley, F. G., Marengo.
Haeger, E. H., Dundee.
Hanley, Daniel, Marengo.
Hayden, C. C., Urbana.
Hoppensteadt, Geo. W., Goodenow.
Hoof, Jno., Marengo.
Hovey, E. L., Cherry Valley.

I

Irish, H. B., Farina.

Independent Oil Sup. Co., LaSalle and Washington Sts., Chicago.

J

Janes, W. E., Hinsdale.

Jennings, A. A., Chicago (Star Union Lines).

Jensen, A. F., Effingham, R. F. D. 4.

Jensen, S. M., Orangeville.

Johnson, Ernest, Hebron.

Johnson, Lewis, Stewardson.

Jones, A. H., State Food Commissioner, Chicago.

Jorgensen, F. A., Urbana.

Johnson, Herman, Marengo.

Joslyn, E. O., Marengo.

K

Kendall, George, Mt. Carroll.

Kent, A. H., Mulberry Grove.

Kirkpatrick, J. R., Oakdale.

Kleckner, H. S., Orangeville.

Koeke, Jno. B., Effingham.

Kolb, John, Elizabeth.

Knigge, L. H., McHenry.

Kuobelock, Geo., Marion.

Kay, W. T., Camp Pint.

Koepsell, R. J., Round Grove.

Knudson, Wm., Union.

Kruger, A. F., Clinton Jct., Wis.

Kueker, W. H., Marengo.

L

Leass, S. L., Sullivan.

Lee, Carl E., Urbana.

Letts, Geo. D., Frankfort Station.

Liell, John M., Edgewood.

Lindley, Hon. C. J., Greenville.

Litchardt, Herman, Schaumberg.

Lloyd, W. B., Kinmundy.

Lohmen, Wm. C., Sorento, R. R. 2.

Long, M., Woodstock.

Loy, J. H., Effingham.

Ludwig, Mat., Lockport.

Lally, W. A., Chicago (N. Y. Despatch Trans. Co.)

Lamos, E. M., Warren.

Larsen, Chris., Ontarioville.

Long, C., Belvidere.

Luesz, Henry, Marengo.

Luhring, August, Marengo.

M

Macey, V. D., Mooresville.

Mallory, Grant, Freeport.

Mann, F. J., Gilman.

Mantz, L. P., Watson.

Mason, J. L., Elgin.

Maule, A., Shirland.

Maurer, W. H., Rock Grove.

McKinon, J. C., Amboy.

McNish, F. J., Chicago (Creamery Package Mfg. Co.)

Metzger, F. L., Millstadt.

Meyer, Adolph, Greenville.

Michener, E. P., Chicago (Briggs House).

M

Mills, Col. Chas., Springfield.
Mingle, John, Toledo.
Mitchell, C. E., Effingham.
Moles, F. R., Chicago.
Moore, W. S., Chicago.
Morris, Jos., Washington.
Murray, Otis C., Johnsburg.
Mackey, L. E., Marengo.
Mann, W. E., Pecatonica.
Marengo Fdry. & M. Co., Marengo.
Marks, C. W., Pecatonica.
Mason, J. P., Elgin.
Marsh, J. N., Huntley.
Marsh, G. W., Huntley.
Matthewson, Wm., Marengo.
Mayer, Otto, Davis.
McCredie, Wm., Elgin.
McCoren C, F., Marengo.
McCullen, A. D., Effingham.
McIntyre, H. M., Marengo.
McKinnon, J. C., Amboy.
McNair, Jos., Winnebago.
Mead, W. F., Marengo.
Metcalf, R. W., Marengo.
Meyer, C. H., Madison, Wis.
Miller, C. C., Marengo.
Miller, F. J., Marengo.
Moren, W. H., Union.
Moren, Robt., Freeport.
Morse, F. S., Woodstock.
Morton, A. S., Marengo.
Morris, Jos., Washington.
Muller, L. Fred, Rockford.
Murphy, S. L., Garden Plain.
Murray, Otis C., McHenry.
Musselman, M. S., Lanark.

N

Nelson, Peter, Creston.
Newman, John, Elgin.
Newman, Joseph, Elgin.
Noel, E. C., Elwood.
Nelson, Alfred, Marengo.
Newman, Walter, Elgin.
Nielson, Louis, Camp Point.

O

Olson, Chas., Kirkland.
Osgood, H. B., Chicago (Creamery Package Mfg. Co.)
Overbeck, Jno., Effingham.
Ocock, T. A., Marengo.
Olesen, S. P., Marengo.
O'Rourke, D., Union.
Osborne, Frank, Marengo.
Osborn, J. W., Butler.
Osborne, J. W., Marengo.
Osborn, F. E., Marengo.
Otis, H. G., Marengo.
Otis, Steve, Marengo.

P

Palmer, F. R., Pearl City.
Palmer, J. A., Effingham.
Parker, R. H., Effingham.
Patterson, Jno. W., Plainfield.
Patton, R. A., Hanna City.
Peak, S. W., Winchester.
Pester, Geo., Manhattan.
Phillips, Edw., Griggsville.
Phillips, Louis, Germantown.
Powell, J. W., Peoria (Merchants' Despatch Transportation Co.)
Patrick Bros., Marengo.

P

Patrick, E. D., Marengo.
Patrick, R. M., Marengo.
Patterson, J. H., Marengo.
Patterson, J. P., Plainfield.
Peak, A. S., Marengo.
Pearson, Wm., Elgin, R. No. 4.
Pease, Clint, Marengo.
Penny Bros., Marengo.
Pennington, J. S., Plainfield.
Pennington, R. H., Plainfield.
Pierce, C. M., Marengo.
Polnon, C., Marengo.
Perkins, G. H., Marengo.
Peters, J., Marengo.
Prescott, C. W., Marengo.

R

Rawson, Frank E., Alden.
Rayner, J. W., Elgin.
Redpath, R. G., Baldwin.
Relf, E., Elwood.
Rice, H. B., Lewiston.
Robbins, Wm., Manhattan.
Roessler, Theodore, Shelbyville.
Rowley, Walter, Lockport.
Rawson, F. E., Woodstock, R. No. 3.
Redpath, R., Marengo.
Redpath, Chas., Marengo.
Renie, P. A., Marengo.
Rep. News. Co., Marengo.
Rhuby, J. W., Mt. Carroll.
Richardson, H. W., Marengo.
Riley, Henry, Marengo.
Ritz, Frank, Marengo.
Robb, Chas., Marengo.
Robb, Samuel, Marengo.

S

Sanmann, J. F., Havana.
Sanmann, W. H., Havana.
Schildmiller, Jno., Thomson.
Schlattman, Fred, St. Libory.
Schoen, H. M., Edgewood.
Schuknecht, H. E., La Grange (Asst. State Food Commissioner.)
Schwartz, Ed., Damascus.
Scotey, W. H., Greenup.
Scott, J. E., Scales Mound.
Shilling, S. B., Mason City, Ia.
Shook, V. A., Freeport.
Simonson, Geo., Renard.
Slegal, Jesse W., Effingham.
Sloggett, John, Hinckley.
Slouborg, Thos., Savanna.
Smith, Andrew, Washington.
Smith, D. C., Lake Zurich.
Spanger, E. E., Big Rock.
Spanger, W. G., Plainfield.
Spencer, C. V., Chicago (Santa Fe Railroad).
Sprague, F., Lockport.
Storm, C., Lockport.
Storms, H., New Lenox.
Straw, T. H., Shannon.
Sumner, J. B., Effingham.
Sur, J. W., Effingham.
Salley, A. S., Roscoe.
Saltwedel, Henry, Effingham.
Samter, G. H., Marengo.
Schmidt, L. C., Marengo.
Schnerden, Joe, Union.
Scott, W. J., Marengo.
Seanow, J., Marengo.
Seward, R. R., Marengo.
Seward & Redpath, Marengo.
Shannon, F. H., Marengo.

S

Sherman, W. H., Belvidere.
Smith, Andrew, Washington.
Smith, W. D., Marengo.
Smith, Frank, Marengo.
Spies, L. A., St. Jacob.
Spitzer, C. N., Marengo.
Sprague, C. N., Joliet.
Sprecker, J. A., Madison, Wis.
Standish, E. B., Marengo.
Steele, J. A., Marengo.
Steffin, Wm., Marengo.
Stanford, G. W., Marengo.
Stevens, F. E., Marengo.
St. John, M. L., Marengo.
Stoxen, Louis, Marengo.
Stoxen, Henry, Union.
Stover, W. J., Chicago (A. H. Barber Co.)
Stull, Paul, Marengo.
Stull, Joel, Marengo.
Sudendorf, E., Clinton.
Swail, A. E., Belvidere.

T

Tatten, Geo. E., Garden Prairie.
Terpening, J. D., New Lenox.
Terry, D. M., Earlville.
Thompkins, H. S., Union.
Thompson, Frank B., Greenwood.
Thornton, Chas. H. Argyle.
Thurston, Henry F., 355 Dearborn St., Chicago.
Talbott, C. H., Marengo.
Tanner, F. J., Marengo.
Timothy, Fred, Marengo.
Thompson, A. E., Marengo.
Turner, J. H., Hebron.

U

Upton, E. N., Effingham.
Ulmer, Jno. T., Effingham.

V

Van Kuren, S. J., Chicago (National Creamery Supply Co.)
Van Volking, F. P., Danville.

W

Walker, Dr. J. H., Effingham.
Wall, J. A., Joliet.
Walton, Edw. B., Arma.
Walton, E. W., Anna.
Weber Dairy Co., Joliet.
Webster, E. H., Washington, D. C. (Chief Dairy Division).
Welsh, S. T., Lake Creek.
Wentworth, E. M., Davenport, Ia. (Star Union Lines).
Wiggins, L. N., Springfield.
Wilkening, W. C., Schaumberg.
Williams, C. H., Chicago (Colonial Salt Co.)
Willson, W. C., Elgin.
Wilson, Chas. G., Martinsville.
Wilson, E. L., Manhattan.
Wood, D. E., Elgin.
Wood, R. L., Woodhull.
Woodard, C. H., Big Rock.
Woodburg, A. E., Danville.
Woolverton, D. C., 154 Lake St., Chicago.
Worman, C. A., Ludopton.

W

Wright, F. W., Joslin.
Waite, C. M., Belvidere.
Warren, L., Marengo.
Waterman, Geo. E., Garden Plain.
Weaver, W. H., Marengo.
Webber, C. N., Marengo.
Weckerly, L. R., Freeport.
Weddidge, F. J., Big Rock, R. No. 11.
Weit, M. E., Elkhorn, Wis. (Nat'l. Cry. Sup. Co.)
Wells, F. C., Harvard.
White Bros., Marengo.
White, Wm. M., Marengo.
Whittemore, Chas., Marengo.
Whittemore, C. B., Marengo.
Wilke, C. D., Marengo.
Wilcox, M. C., Marengo.
Wilcox, Clarence, Marengo.
Williams, J., Marengo.
Willwerth, H. J., Wyandotte, Mich. (J. B. Ford Co.)
Wilson, R. A., Harvard, R. No. 1.
Wingert, J. C., Marengo.
Wolcott, G. R., Marengo.
Woleben, R. H., Marengo.
Woleben, N. V., Marengo.
Woodward, W. C., Marengo.
Wyman, E. S., Sycamore.

Y

Youngs, H. J., Belvidere.

Z

Zeller, Armand, Highland.
Zienk, Jno., Marengo.

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